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Green River Resource Area 1992

Green River Resource Area Resource Management Plan and Draft Environmental Impact Statement

Volume 3 of 3

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TABLE OF CONTENTS

Volume 1

CHAPTER 1 - PURPOSE OF AND NEED FOR THE PLANNING EFFORT 5

CHAPTER 2 - DESCRIPTIONS OF THE ALTERNATIVES, INCLUDING THE PREFERRED RESOURCE MANAGEMENT PLAN 17

CHAPTER 3 - AFFECTED ENVIRONMENT 337

Volume 2

CHAPTER 4 - ENVIRONMENTAL CONSEQUENCES 459

CHAPTER 5 - CONSULTATION AND COORDINATION 613

Volume 3

APPENDIXES

Appendix 1 - Planning 633
  1-1, Planning Process Description 633
  1-2, General Criteria and Considerations for Alternative Formulation 635

Appendix 2 - BLM Standard Mitigation Guidelines 637

Appendix 3 - Coal 643
  3-1, Summary of 1981 Coal Screening Process 643
  3-2, 1992 Coal Screening Process 645
  3-3, Other Multiple Use Conflict Analysis 667

Appendix 4 - Wild and Scenic Rivers 673
  4-1, Analysis of Rivers and Streams 673
  4-2, W&S Rivers Eligibility Screening 677
  4-3, Segment Identification and Preliminary Classification 683
  4-4, Wild & Scenic Rivers Suitability Assessment 689

Appendix 5 - Air, Soil, Water 691
  5-1, Best Management Practices 691
  5-2, Wyoming Air Quality Regulations on Fugitive Dust Suppression 695
  5-3, ERRP 697
  5-4, General Soils Map Legend 699
  5-5, Soils 703

Appendix 6 - Cultural 705
  6-1, Section 106 Compliance Process 705
  6-2, General Cultural Prescriptions 709

Appendix 7 - Minerals 711
  7-1, Procedures for O&G Application Processing in Areas of Seasonal Restriction 711
  7-2, Standard Practices Applied to Surface-Disturbing Activities 715

CONTENTS

7-3, Oil and Gas Operations 719
7-4, Oil and Gas Units 735
7-5, Production Figures for Oil and Gas Fields and Units 737
7-6, H2S Risk Analysis 747
7-7, Mining Methods 755
7-8, Exploration 757
7-9, Coal and Sodium Leasing Procedures 761

Appendix 8 - Lands ....`767
8-1, Lands Identified as Possibly Suitable for Disposal 767
8-2, Disposal Criteria 769
8-3, Proposed Acquisitions 771

Appendix 9 - Livestock Grazing 775
9-1, Allotment Monitoring and Categories 775
9-2, Management Decision Priorities for Implementation - High 777
9-3, Management Decision Priorities for Implementation - Low 779
9-4, Proposed Allotment Projects 781
9-5, SOPs for Range Improvements and Vegetation Manipulations 787
9-6, Implementation of Grazing Use 793
9-7, Range Improvements 797
9-8, Allotment Categorization 799
9-9,Resource Monitoring and Evaluation of Allotments and Wild Horse Herd Management Areas 801
9-10, Resource Conflicts/Potential Conflicts in Allotments 803

Appendix 10 - Socioeconomic Tables 805

Appendix 11 - Vegetation 827
11-1, Production Parameters for Vegetation Communities 827
11-2, Average Stocking Rates 829
11-3, Summary of Fire Effects on Major Grass & Grasslike Species 831
11-4, Response of Cold Desert Forbs to Fall Burning 833
11-5, Summary of Fire Effect on Major Shrub Species in the Drier 835
11-6, Poisonous Plant List 837
11-7, Noxious Weeds 839

Appendix 12 - Impacts and Relationships Common to All Alternatives 841

Appendix 13 - Figures Used for General Assumptions for All Alternatives 857

Maps

Map 82 - Coal Development Potential Area 646
Map 83 - Coal Screening Process: Unsuitable Areas 657
Map 84 - Alt. B Coal Screening Process 660
Map 85 - Alt. C Coal Screening Process 661
Map 86 - Pre. Alt. Coal Screening Process: Acceptable for Subsurface Mining 663
Map 87 - Pre. Alt. Coal Screening Process: Acceptable for Mining with Restrictions 664
Map 88 - Pre. Alt. Coal Screening Process: Unsuitable and Unacceptable Areas 665
Map 89 - Existing Oil and Gas Wells 728
Map 90 - Abandoned Oil and Gas Wells 732
Map A - Land Status ....Pocket
Map B - Mineral Status ....Pocket
Map C - Grazing Allotments and Land Status ....Pocket

CONTENTS

Figures

Figure 16 - Cultural Resources Process 707
Figure 17 - Location Layout for a Well 9,000 to 15,000 Feet Deep 723
Figure 18 - Diagram of a Rotary Rig 725

APPENDIX 1-1

PLANNING PROCESS DESCRIPTION

Step 1: Identification of Issues

Step 1 is intended to identify resource management problems, conflicts, or opportunities that can be resolved through the planning process.

Several public notices were published and an open house was held to gain public input into identifying land and resource use management problems, conflicts, or opportunities in the resource area. Along with the general public, other federal agencies, and state and local governments were also asked to participate in the issue identification process. The BLM combined the information from these and internal sources into four planning issues that could be resolved through the RMP EIS process. The issues were published and distributed to interested parties.

Step 2: Development of Planning Criteria

Step 2 involves development of criteria to identify the standards, guidelines, and constraints that would apply to the planning process. These criteria are the "sideboards" that were applied by the specialists so that their work was focused on resolution of the issues. The original criteria were made available to interested parties for review. Criteria were revised as the planning issues were defined.

Step 3: Inventory and Data Collection

Step 3 allows for the collection of various kinds of issue-related resource, environmental, social, and economic data. During this phase, information was collected on range conditions, and data on wildlife habitat and watershed conditions was collected. Information was also obtained from grazing lessees regarding management opportunities and typical operations of individual ranches and minerals industry regarding mineral potential. Existing information was used for all other aspects of the plan.

Step 4: Analysis of the Management Situation

The analysis of the management situation (MSA) supports all subsequent steps in planning. Each specialist on the interdisciplinary team was involved in preparing the three sections of the MSA. The sections include: a physical profile and brief description of each resource; the current management situation which describes current management practices by resource and the status of on-going programs. This section provides the basis for the description of the No Action alternative and the basis for the planning issues; and the analysis of future demands which identifies present and future resource and land demands, capabilities, and problems and conflicts of current management. The MSA is on file at the Green River Resource Area Office.

Step 5: Formulation of Alternatives

Four alternatives were developed by the interdisciplinary team. These alternatives, described in Chapter 2, include the Preferred Alternative, Alternative A or No Action (continuation of current management), and Alternatives B and C. The alternatives represent variations of levels of resource use and environmental protection while providing means of resolving the issues.

Step 6: Analysis of Environmental Consequences of Alternatives

The physical, biological, social, and economic effects of implementing each alternative are assessed. This step is the environmental impact analysis required by NEPA. The analysis is presented in Chapter 4.

Step 7: Selection of the Preferred Management Plan

Selection of the preferred management plan was based on public input and coordination, current BLM management policies and directions, and analysis of the impacts of each alternative. A combination of parts of Alternatives A, B, and C was selected as the preferred management plan because it is believed to offer the best balance of land management decisions for resolving the issues of the resource area in the public interest.

Step 8: Selection of the Proposed Resource Management Plan

Based on the result of public review and comment, a proposed resource management plan will be selected and published with a final EIS. The selection and approval of the resource management plan is made after a 30-day protest period on the proposed plan. Any person who participated in the planning process and who has an interest which is or may be adversely affected by adoption of the plan may protest its approval. A protest may raise only those issues which were submitted for the record during the planning process.

Step 9: Monitoring and Evaluation

This step involves monitoring the selected plan, after it is implemented, and evaluating the results of the implementation. Data on long-term trends and resource conditions will be collected and analyzed to determine the effectiveness of the plan. Monitoring may result in revisions to the plan.

APPENDIX 1-2

GENERAL CRITERIA AND CONSIDERATIONS FOR ALTERNATIVE FORMULATION

The following factors will be considered in one or more of the alternatives of the Green River RMP/EIS:

Management emphasis for and possible designation of areas nominated as special management areas, including ACECs.

Fire management and fire suppression options.

Intensive management of cultural and historic resources, including rock art occurrences and historic trails.

Various types and levels of vegetation uses, including timber harvest, wildlife habitat, watershed protection, livestock grazing, etc.

Minerals exploration and development, authorizations related to rights-of-way and other lands and realty actions, off-road vehicle use, and other activities that may result in surface disturbance.

Opportunities for land disposal or acquisition that could be useful in meeting goals for resource manageability and condition.

Acquisition of access to provide reasonable levels of resource uses for the public and for resource development and manageability.

Management objectives and direction for BLM administered public lands on which BLM withdrawals may be terminated in the future.

Recommendation of protective withdrawals needed to improve resource manageability.

Identification of right-of-way corridors, exclusion areas, and avoidance areas to provide for development needs and protection of resource values.

Various levels of livestock grazing.

Management of recreational use and designation of special recreation management areas (SRMAs).

Protecting unique and nonrenewable geological, cultural, paleontological, and recreational values.

Management options for protecting or enhancing wetlands and riparian areas.

Maintaining various numbers of wild horses.

The big game population goals of the Wyoming Game and Fish Department (WGFD).

Protection and enhancement of habitat for sensitive or important wildlife and plant species.

Protection of recovery habitat and essential habitat for threatened or endangered wildlife and plant species.

Criteria for Effects to be Considered

The following types of effects should be addressed in identifying and analyzing the environmental consequences of the planning alternatives:

Effects of maintaining or reducing wild horse herd sizes.

Effects on land and resource uses from retention or termination of existing BLM withdrawals and other BLM land use classifications and segregations.

Effects of surface-disturbing land uses and other human activities on air quality, cultural resources, recreational opportunities, watershed, and wildlife resources.

Effects caused by livestock grazing, disposal or acquisition of land, pesticide use, and use of or restrictions on ORV use.

Effects of fencing on antelope movement and migration.

Effects of all types of land and resource uses on the vegetation resource.

Economic impacts of land use restrictions on economic sectors that are heavily dependent on the use of public lands and resources (for example, minerals exploration and development, timber harvesting, livestock grazing, and recreation activities).

Effects in all alternatives generally use existing data for analysis.

Criteria for Selection of the Preferred Alternative

Answers to the following questions will be used to guide selection of the preferred alternative:

Do the alternatives meet guidelines for reduction of sedimentation and salinity, as stated in water quality plans of the State of Wyoming and the Environmental Protection Agency (EPA)?

What levels of land use restrictions are needed to provide adequate protection of resource values?

Do the alternatives retain reasonable accessibility of public lands for purposes of public access, public land use, and resource development?

In proposing resource allocations that would affect the availability of lands for mineral development, has the BLM considered the potential of those lands for occurrence and development of energy and mineral resources?

Are the alternatives consistent with plans, programs, and policies of other federal agencies, state and local governments, and Indian tribes?

APPENDIX 2

WYOMING BUREAU OF LAND MANAGEMENT (BLM) STANDARD MITIGATION GUIDELINES FOR SURFACE-DISTURBING ACTIVITIES

INTRODUCTION

The "Wyoming BLM Standard Oil and Gas Lease Stipulations" were developed in 1986. During their implementation, it was recognized that various land uses, other than those related to oil and gas exploration and development, should be subject to similar kinds of environmental protection requirements. Using the Wyoming BLM standard oil and gas lease stipulations as a basis, development of the "Wyoming BLM Standard Mitigation Measures for Surface-Disturbing Activities" began.

The term "guidelines" better describes the intent and use of these mitigation standards than the terms "stipulations" or "measures." These guidelines are primarily for the purpose of attaining statewide consistency in how requirements are determined for avoiding and mitigating environmental impacts and resource and land use conflicts. Consistency in this sense does not mean that identical requirements would be applied for all similar types of land use activities that may cause similar types of impacts. Nor does it mean that the requirements or guidelines for a single land use activity would be identical in all areas.

There are two ways the standard mitigation guidelines are used in the resource management plan/environmental impact statement (RMP/EIS) process: (1) as part of the planning criteria in developing the RMP alternatives, and (2) in the analytical processes of both developing the alternatives and analyzing the impacts of the alternatives. In the first case, an assumption is made that any one or more of the standard mitigations will be appropriately included as conditions of relevant actions being proposed or considered in each alternative. In the second case, the standard mitigations are used (1) to develop a baseline for measuring and comparing impacts among the alternatives; (2) to identify other actions and alternatives that should be considered, and (3) to help determine whether more stringent or less stringent mitigations should be considered.

Some of the seasonal restrictions in the standard oil and gas lease stipulations contain the statement, "This limitation does not apply to maintenance and operation of producing wells." This statement was included because the stipulations were developed specifically for application to oil and gas leases at the time of issuance, not for activities associated with producing wells. At lease issuance, the only action that can be generally contemplated is the possibility that exploratory drilling may occur somewhere on the lease area. Unfortunately, the provision has been interpreted by some people to mean that the seasonal restriction disappears at the operational stage (i.e., if a producing well is attained). It must be understood that at both the oil and gas exploration stage and the operation or development stages, additional site-specific environmental analyses are conducted and any needed restrictions or mitigations identified become part of the operational or development plan. For example, wells may continue to produce, but related activity may be limited. Thus, it is possible for such seasonal restrictions to continue in effect and be applicable to maintenance and operation of producing wells, if supported by the environmental analyses.

The RMP/EIS does not decide or dictate the exact wording or inclusion of these guidelines. Rather, the standard guidelines are used in the RMP/EIS process as a tool to help develop the RMP alternatives and to provide a baseline for comparative impact analysis in arriving at RMP decisions. These guidelines will be used in the same manner in analyzing activity plans and other site-specific proposals. These guidelines and their wording are matters of policy. As such, specific wording is subject to change primarily through administrative review, not through the RMP/EIS process. Any further changes that may be made in the continuing refinement of these guidelines and any development of program-specific standard stipulations will be handled in another forum, including appropriate public involvement and input.

PURPOSE

The purpose of the "Standard Mitigation Guidelines" are (1) to reserve, for the BLM, the right to modify the operations of all surface and other human presence disturbance activities as part of the statutory requirements for environmental protection, and (2) to inform a potential lessee, permittee, or operator of the requirements that must be met when using BLM-administered public lands. These guidelines have been written in a format that will allow for (1) their direct use as stipulations, and (2) the addition of specific or specialized mitigation following the submission of a detailed plan of development or other project proposal, and an environmental analysis.

Those resource activities or programs currently without a standardized set of permit or operation stipulations can use the mitigation guidelines as stipulations or as conditions of approval, or as a baseline for developing specific stipulations for a given activity or program.

Because use of the mitigation guidelines was integrated into the RMP/EIS process and will be integrated into the site-specific environmental analysis process, the application of stipulations or mitigation requirements derived through the guidelines will provide more consistency with planning decisions and plan implementation than has occurred in the past. Application of the standard mitigation guidelines to all surface and other human presence disturbance activities concerning BLM-administered public lands and resources will provide more uniformity in mitigation than has occurred in the past.

ALL STANDARD MITIGATION GUIDELINES

1. Surface Disturbance Mitigation Guideline

Surface disturbance will be prohibited in any of the following areas or conditions. Exception, waiver, or modification of this limitation may be approved in writing, including documented supporting analysis, by the Authorized Officer.

a. Slopes in excess of 25 percent.

b. Within important scenic areas (Class I and II Visual Resource Management Areas).

c. Within 500 feet of surface water and/or riparian areas.

d. Within either one-quarter mile or the visual horizon (whichever is closer) of historic trails.

e. Construction with frozen material or during periods when the soil material is saturated or when watershed damage is likely to occur.

Guidance

The intent of the SURFACE DISTURBANCE MITIGATION GUIDELINE is to inform interested parties (potential lessees, permittees, or operators) that when one or more of the five (1a through 1e) conditions exist, surface-disturbing activities will be prohibited unless or until a permittee or his designated representative and the surface management agency (SMA) arrive at an acceptable plan for mitigation of anticipated impacts. This negotiation will occur prior to development.

Specific criteria (e.g., 500 feet from water) have been established based upon the best information available. However, such items as geographical areas and seasons must be delineated at the field level.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

2. Wildlife Mitigation Guideline

a. To protect important big game winter habitat, activities or surface use will not be allowed from November 15 to April 30 within certain areas encompassed by the authorization. The same criteria apply to defined big game birthing areas from May 1 to June 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

b. To protect important raptor and/or sage and sharp-tailed grouse nesting habitat, activities or surface use will not be allowed from February 1 to July 31 within certain areas encompassed by the authorization. The same criteria apply to defined raptor and game bird winter concentration areas from November 15 to April 30.

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

c. No activities or surface use will be allowed on that portion of the authorization area identified within (legal description) for the purpose of protecting (e.g., sage/sharp-tailed grouse breeding grounds, and/or other species/activities) habitat.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

d. Portions of the authorized use area legally described as (legal description), are known or suspected to be essential habitat for (name) which is a threatened or endangered species. Prior to conducting any onsite activities, the lessee/permittee will be required to conduct inventories or studies in accordance with BLM and U.S. Fish and Wildlife Service guidelines to verify the presence or absence of this species. In the event that (name) occurrence is identified, the lessee/permittee will be required to modify operational plans to include the protection requirements of this species and its habitat (e.g., seasonal use restrictions, occupancy limitations, facility design modifications).

Guidance

The WILDLIFE MITIGATION GUIDELINE is intended to provide two basic types of protection: seasonal restriction (2a and 2b) and prohibition of activities or surface use (2c). Item 2d is specific to situations involving threatened or endangered species. Legal descriptions will ultimately be required and should be measurable and legally definable. There are no minimum subdivision requirements at this time. The area delineated can and should be defined as necessary, based upon current biological data, prior to the time of processing an application and issuing the use authorization. The legal description must eventually become a part of the condition for approval of the permit, plan of development, and/or other use authorization.

The seasonal restriction section identifies three example groups of species and delineates three similar time frame restrictions. The big game species including elk, moose, deer, antelope, and bighorn sheep, all require protection of crucial winter range between November 15 and April 30. Elk and bighorn sheep also require protection from disturbance from May 1 to June 30, when they typically occupy distinct calving and lambing areas. Raptors include eagles, accipiters, falcons (peregrine, prairie, and merlin), buteos (ferruginous and Swainson's hawks), osprey, and burrowing owls. The raptors and sage and sharp-tailed grouse require nesting protection between February 1 and July 31. The same birds often require protection from disturbance from November 15 through April 30 while they occupy winter concentration areas.

Item 2c, the prohibition of activity or surface use, is intended for protection of specific wildlife habitat areas or values within the use area that cannot be protected by using seasonal restrictions. These areas or values must be factors that limit life-cycle activities (e.g., sage grouse strutting grounds, known threatened and endangered species habitat).

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

3. Cultural Resource Mitigation Guideline

When a proposed discretionary land use has potential for affecting the characteristics which qualify a cultural property for the National Register of Historic Places (National Register), mitigation will be considered. In accordance with Section 106 of the Historic Preservation Act, procedures specified in 36 CFR 800 will be used in consultation with the Wyoming State Historic Preservation Officer and the Advisory Council on Historic Preservation in arriving at determinations regarding the need and type of mitigation to be required.

Guidance

The preferred strategy for treating potential adverse effects on cultural properties is "avoidance." If avoidance involves project relocation, the new project area may also require cultural resource inventory. If avoidance is imprudent or unfeasible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative measures.

Reports documenting results of cultural resource inventory, evaluation, and the establishment of mitigation alternatives (if necessary) shall be written according to standards contained in BLM Manuals, the cultural resource permit stipulations, and in other policy issued by the BLM. These reports must provide sufficient information for Section 106 consultation. Reports shall be reviewed for adequacy by the appropriate BLM cultural resource specialist. If cultural properties on, or eligible for, the National Register are located within these areas of potential impact and cannot be avoided, the Authorized Officer shall begin the Section 106 consultation process in accordance with the procedures contained in 36 CFR 800.

Mitigation measures shall be implemented according to the mitigation plan approved by the BLM Authorized Officer. Such plans are usually prepared by the land use applicant according to BLM specifications. Mitigation plans will be reviewed as part of Section 106 consultation for National Register eligible or listed properties. The extent and nature of recommended mitigation shall be commensurate with the significance of the cultural resource involved and the anticipated extent of damage. Reasonable costs for mitigation will be borne by the land use applicant. Mitigation must be cost effective and realistic. It must consider project requirements and limitations, input from concerned parties, and be BLM approved or BLM formulated.

Mitigation of paleontological and natural history sites will be treated on a case-by-case basis. Factors such as site significance, economics, safety, and project urgency must be taken into account when making a decision to mitigate. Authority to protect (through mitigation) such values is provided for in FLPMA, Section 102(a)(8). When avoidance is not possible, appropriate mitigation may include excavation (data recovery), stabilization, monitoring, protection barriers and signs, or other physical and administrative protection measures.

4. Special Resource Mitigation Guideline

To protect (resource value), activities or surface use will not be allowed (i.e., within a specific distance of the resource value or between date to date) in (legal description).

Application of this limitation to operation and maintenance of a developed project must be based on environmental analysis of the operational or production aspects.

Exception, waiver, or modification of this limitation in any year may be approved in writing, including documented supporting analysis, by the Authorized Officer.

Example Resource Categories (Select or identify category and specific resource value):

a. Recreation areas.

b. Special natural history or paleontological features.

c. Special management areas.

d. Sections of major rivers.

e. Prior existing rights-of-way.

f. Occupied dwellings.

g. Other (specify).

Guidance

The SPECIAL RESOURCE MITIGATION GUIDELINE is intended for use only in site-specific situations where one of the first three general mitigation guidelines will not adequately address the concern. The resource value, location, and specific restrictions must be clearly identified. A detailed plan addressing specific mitigation and special restrictions will be required prior to disturbance or development and will become a condition for approval of the permit, plan of development, or other use authorization.

Exception, waiver, or modification of requirements developed from this guideline must be based upon environmental analysis of proposals (e.g., activity plans, plans of development, plans of operation, applications for permit to drill) and, if necessary, must allow for other mitigation to be applied on a site-specific basis.

5. No Surface Occupancy Guideline

No Surface Occupancy will be allowed on the following described lands (legal description) because of (resource value).

Example Resource Categories (Select or identify category and specific resource value):

a. Recreation Areas (e.g., campgrounds, historic trails, national monuments).

b. Major reservoirs/dams.

c. Special management area (e.g., areas of critical environmental concern, known threatened or endangered species habitat, wild and scencic rivers).

d. Other (specify).

Guidance

The NO SURFACE OCCUPANCY (NSO) MITIGATION GUIDELINE is intended for use only when other mitigation is determined insufficient to adequately protect the public interest and is the only alternative to "no development" or "no leasing." The legal description and resource value of concern must be identified and be tied to an NSO land use planning decision.

Waiver of, or exception(s) to, the NSO requirement will be subject to the same test used to initially justify its imposition. If, upon evaluation of a site-specific proposal, it is found that less restrictive mitigation would adequately protect the public interest or value of concern, then a waiver or exception to the NSO requirement is possible. The record must show that because conditions or uses have changed, less restrictive requirements will protect the public interest. An environmental analysis must be conducted and documented (e.g., environmental assessment, environmental impact statement, etc., as necessary) in order to provide the basis for a waiver or exception to an NSO planning decision. Modification of the NSO requiremet will pertain only to refinement or correction of the location(s) to which it applied. If the waiver, exception, or modification is found to be consistent with the intent of the planning decision, it may be granted. If found inconsistent with the intent of the planning decision, a plan amendment would be required before the waiver, exception, or modification could be granted.

When considering the "no development" or "no leasing" option, a rigorous test must be met and fully documented in the record. This test must be based upon stringent standards described in the land use planning document. Since rejection of all development rights is more severe than the most restrictive mitigation requirement, the record must show that consideration was given to development subject to reasonable mitigation, including "no surface occupancy." The record must also show that other mitigation was determined to be insufficient to adequately protect the public interest. A "no development" or "no leasing" decision should not be made solely because it appears that conventional methods of development would be unfeasible, especially where an NSO restriction may be acceptable to a potential permittee. In such cases, the potential permittee should have the opportunity to decide whether or not to go ahead with the proposal (or accept the use authorization), recognizing that an NSO restriction is involved.

APPENDIX 3-1

SUMMARY OF 1981 COAL SCREENING PROCESS AND COAL PLANNING DECISIONS

Coal screening/planning was initially completed for the coal development potential area within the Green River Resource Area in 1981. The results of this process are summarized here and in the coal section of Alternative A in this RMP EIS.

The 1981 coal screening/planning results are now outdated and superseded by the 1992 process conducted for this Green River RMP planning effort. The 1981 information is addressed here and presented in Alternative A of this EIS for purposes of comparative impact analysis only.

The detailed information on the findings of the 1981 screening process may be found in the Big Sandy and Salt Wells Coal Brochures (USDI 1981c and 1981d). Table A3-1 provides a brief summary of these findings.

TABLE A3-1

COAL SCREEN (ALTERNATIVE A)

Criteria	Land Status[1]	Surface Unsuitable (acres)	Subsurface Acres	
			Unsuitable	Limited[2]
City Rock Springs/Superior	FS/FC	880	840	—
Right-of-way	FS/FC	1,362	1,278	1,362
	FS/SC	360	50	—
Buffer Zone (ROW, Comm)	FS/FC	132	116	—
	FS/SC	18	18	—
Historic Lands & Sites	FS/FC	1,600	—	2,360
Eagle Nest/Buffer	FS/FC	5,410	—	4,220
	FS/SC	1,600	—	1,600
	PRLA[3]	1,350[2]	—	1,350
Falcon Cliff/ Nesting	FS/FC	5,100	—	4,310
	FS/SC	660	—	660
	PRLA[3]	440[2]	—	440
Migratory Bird Habitat	FS/FC	7,420	—	6,250
	FS/SC	1,780	—	1,780
	PRLA[3]	1,350	—	1,350
Wildlife (State Hi Int)	FS/FC	3,520	—	—
	FS/SC	640	—	—
	PRLA	8,522	—	—
Floodplains	FS/FC	240	240	—
Multiple Use Conflicts				
Urban Expansion	FS/FC	1,830	1,640	500
Emmons Cone Area	FS/FC	130	160	160
Natural Corrals	FS/FC	240	—	320
Superior Recharge Area	FS/FC	1,040	1,760	—
Cedar Canyon	FS/SC	160	160	—
	PRLA[3]	180	180	—
Corridor Study	FS/FC	300	3,420	—
Known Geologic Structures	FS/FC	1,620	3,620	—
Coal Leases[4]	FS/FC	1,880	1,880	—

[1] FS/FC - Federal Surface/Federal Coal; FS/SC - Federal Surface/State Coal

[2] Limited or no surface occupancy with subsurface mining.

[3] The PRLAs referred to are no longer active applications.

[4] Coal leases referred to have been relinquished.

NOTE: Acreage is not cumulative, may be repeated in Criteria/Conflicts.

APPENDIX 3-2

1992 COAL SCREENING PROCESS

INTRODUCTION

Since the Federal coal lands within the Green River Resource Area were reviewed and evaluated in 1981, there have been some changes in the Federal coal regulations and in the coal screening/planning procedures. In addition, a considerable amount of new coal resource data has been compiled that represents a significant increase in the area and amount of Federal coal that has development potential. The status of other land and resource values and uses in the coal development potential area have also changed. Thus, the 1981 coal planning results have become outdated and are unuseable as a viable planning base for managing the Federal coal program in the planning area.

The purpose for conducting another review and evaluation of the coal development potential area at this time is to update the coal resource data, the coal screening results and the coal planning decisions for the planning area with new data gathered since 1981. This information and the results of the new review will be used to provide opportunities for short-term and long-term development of Federal coal in an orderly and timely manner, consistent with the Federal Coal Management Program, policies, environmental integrity, national energy needs, and related demands. Development of this RMP EIS will serve as a mode for public input to the coal screening process.

AREA DESCRIPTION

The area reviewed for Federal coal development in the Green River Resource Area (i.e., the coal development potential area) lies within the Green River-Hams Fork Coal Region of northwest Colorado and south-central/southwestern Wyoming and is shown on Map 82. The review area is underlain by an estimated 8.5 billion tons of Federal coal reserves. This coal contains an average of 10,244 British Thermal Units (BTUs) of energy per pound and an average sulfur content of 0.8 percent.

The central portion of the area has a checkerboard coal and land ownership pattern with alternating sections of Federal and non-Federal coal and lands. Map 82 shows the land and coal ownership status in this area.

In some cases, the land and coal ownership in the area is split (i.e., split estate). There are areas of state or privately-owned land surface overlying Federally-owned coal, and there are areas of Federally-owned land surface overlying state or privately-owned coal. The latter situation is addressed only to determine surface impacts and the need for surface management stipulations and mitigation requirements, should this private or state coal be developed.

Only the coal within the structural Rock Springs Uplift of the area was reviewed and evaluated. Any consideration for possible coal development outside this area will be reviewed as demand and need dictate. Existing Federal coal leases are not appropriate for review. However, these existing leases were taken into account in the reasonably foreseeable coal development scenarios and in the impact analyses conducted for the RMP EIS.

COAL SCREENING/PLANNING PROCEDURES

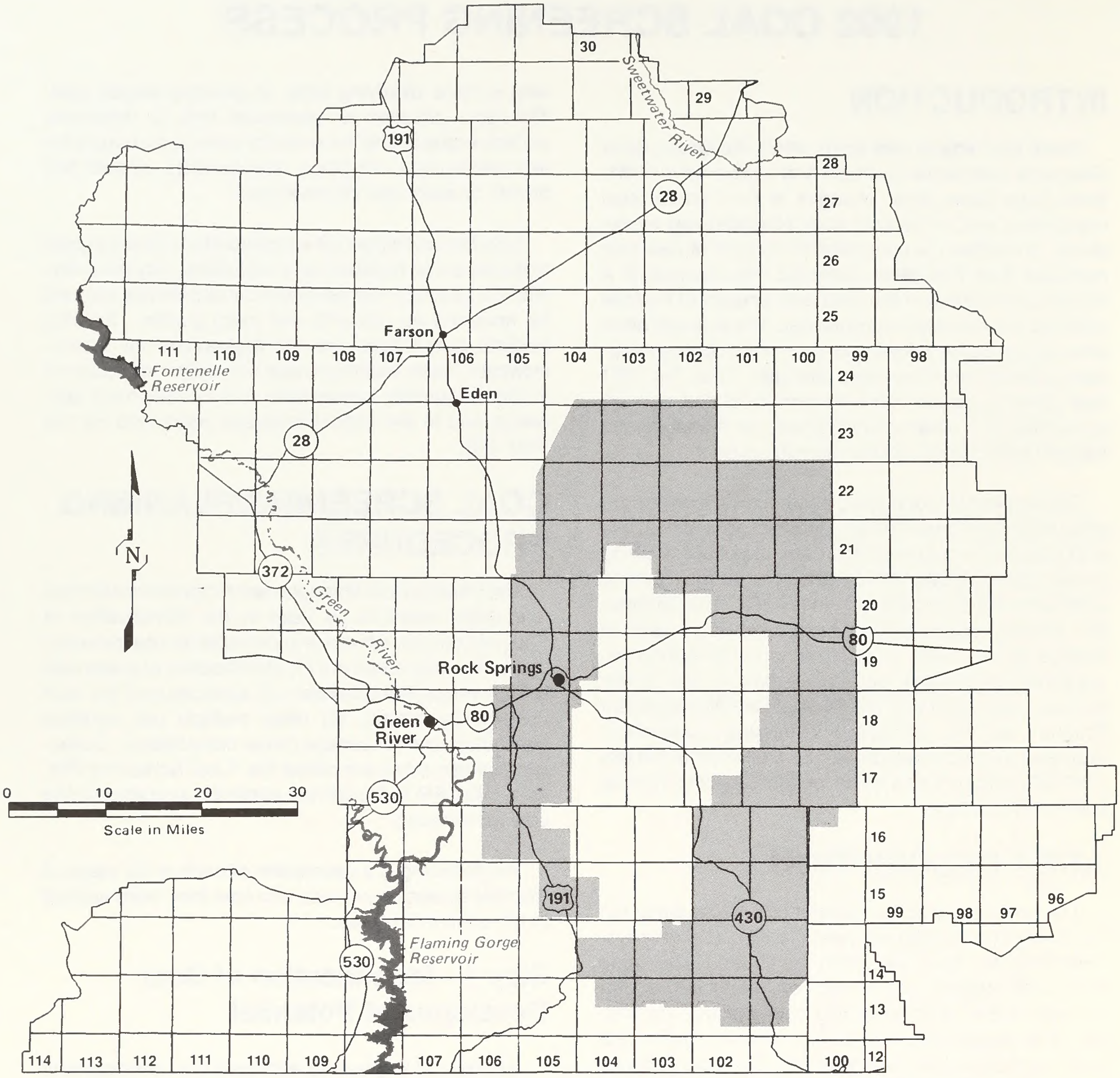
The Federal Coal Management Program established four major steps to be used in the identification of Federal coal areas that are acceptable for coal development. The four steps are (1) identification of areas with coal development potential; (2) application of the coal unsuitability criteria; (3) other multiple use conflicts evaluation; and (4) surface owner consultation. Collectively, these steps are called the "Coal Screening Process" (43 CFR 3461) and are applied in sequence to the coal review area.

The following is a description of each of the steps of the coal screening process and how they were applied to the coal review area.

Step 1 - Identification of Coal Development Potential

All areas of known and assumed coal development potential for both surface and subsurface mining were identified using geological and economic data submitted by coal companies and interpretations of available geological data from various other sources. The remaining three screening steps were applied to the coal development potential areas (both known and assumed) identified.

These latter coal screening steps are applied n sequence and only to the lands identified as acceptable for coal development in each preceding step. This results in (1) identifying areas that are acceptable for coal development in each of these 3 steps; and (2) identifying



▨ Coal Development Potential Area

Map 82

Coal Development Potential Area

Green River Planning Area

areas that are unsuitable (Step 2), unacceptable (Step 3), and unavailable (Step 4) for coal development. Finally, all Federal coal areas that pass through the screening process are determined to be acceptable for further consideration for leasing and development.

Step 2 - Application of Coal Unsuitability Criteria

As required by 43 CFR 3461, the 20 coal unsuitability criteria were applied to all known and assumed coal development potential areas.

These criteria involve consideration of existing resource values such as scenic areas, natural and historic values, wildlife, floodplains, alluvial valley floors, etc. The purpose of this step is to identify areas with key features of environmental sensitivity that would make them "unsuitable" for surface or subsurface coal mining, or for surface operations and impacts associated with coal mining.

Step 3 - Multiple Use Conflict Evaluation

This step is a review of those Federal coal lands that remain acceptable after applying the coal unsuitability criteria. It involves consideration of other multiple use values (i.e., not concerned with the unsuitability criteria) and identifying any additional areas that would be "unacceptable" for surface or subsurface coal mining or for surface operations and impacts associated with coal mining.

Step 4 - Surface Owner Consultation

Section 714 of the Surface Mining Control and Reclamation Act requires BLM to consult with certain "qualified" owners of split estate lands (i.e., private surface ownership over federally owned coal) when surface mining of the Federal coal is being considered. This is being initiated during the public review and comment period for the draft RMP EIS.

This step does not apply to areas where only subsurface mining methods are concerned. It involves only those split estate lands within competitive Federal coal areas that remain acceptable for consideration for leasing and development by surface mining methods after conducting the multiple use conflict evaluation.

In this consultation process, qualified surface owners are asked to express their preference for or against surface mining of the Federal coal under their private lands. An individual surface owner or significant numbers of these surface owners expressing a preference against surface mining, could result in identifying some of these split estate lands as "unavailable" for leasing and development of the Federal coal. In such cases, the areas can still be considered for possible leasing beyond this land use planning stage. This is possible because the actual commitment of surface owner consent or refusal to consent does not occur until later in the coal activity planning process, or in final processing of an individual coal lease application, prior to offering a lease for the Federal coal involved.

HOW THE PROCEDURES ARE APPLIED

To help clarify the coal screening process conducted in the planning area, three categories of coal and land/mineral ownership relationships are identified: (1) competitive Federal coal lease areas; (2) PRLAs (noncompetitive Federal coal lease areas); and (3) areas where Federally-owned land surface overlies state or privately-owned coal. Competitive Federal coal areas are those with the potential to be considered for new competitive Federal coal leasing for either surface or subsurface mining methods, modifications to existing leases, emergency leasing, and exchanges. PRLA areas are those where processing of existing preference right Federal coal lease applications has not been completed. Areas where BLM-administered Federally-owned land surface overlies state or privately-owned coal involve potential conflict situations between managing the Federal land surface and development of the non-federal coal.

The following procedures are in accordance with the Mineral Leasing Act of 1920, the Federal Coal Leasing Amendments Act of 1976, the Federal Land Policy and Management Act of 1976, the Surface Mining Control and Reclamation Act of 1977, the Federal Coal Management Program adopted by the Secretary of the Interior in June 1979, and all relative Federal regulations.

Competitive Federal Coal Areas

All four steps of the screening process are applicable to these areas, when considering surface (e.g., strip) mining methods. Only steps 1-3 of the screening process are applicable to these areas, when considering subsurface (e.g., underground) mining methods.

Preference Right Lease Application (PRLA) Areas

The connotation of "Preference Right" is that any leases issued on PRLAs are "noncompetitive." That is, if in the processing of PRLAs it is determined that the Federal coal they contain can be economically developed in an environmentally sound manner (either wholly or in part), the areas will be leased and the leases will be issued to only the holders of the preference right applications. These rights were established under the Mineral Leasing Act of 1920 for prospecting permits before the Federal Coal Leasing Amendments Act (FCLAA 1976) went into effect. The FCLAA abolished noncompetitive (Preference Right) coal leasing, subject to valid existing rights. The only PRLAs within the Green River Resource Area that remain qualified for processing are those in the Beans Spring PRLA project.

Procedures for processing PRLAs are only partially related to the coal screening process. That is, only steps 2 and 3 of the screening process are applicable. Conducting these procedures for PRLAs may be completed as a part of the land use planning process, or it could be conducted as a separate process. As a matter of efficiency and timing, BLM elected to conduct the unsuitability criteria application and the multiple use conflict evaluation for the PRLAs during land use planning. Thus, the Green River RMP EIS will provide a basic resource analysis for use in the remaining PRLA processing requirements.

The potential impacts of coal development upon the values and concerns identified in the PRLA area are currently being addressed in the preparation of an environmental impact statement (EIS). This will result in development of necessary stipulations and mitigation requirements to be used in the final adjudication of the applicant's right to a coal lease. Final adjudication could result in either rejection of the application, issuance of the coal lease, or exchange of sensitive value areas that should not be mined.

Federal Surface-State Coal Areas

Only steps 2 and 3 of the screening process are applicable to these areas. In applying these screening steps, any areas of the Federal land surface with key features, environmental sensitivity, or other values that would make them unsuitable or unacceptable for coal development are identified. State-owned coal reserves are not considered. The purpose for applying these screening steps to these areas is to provide a basic resource analysis for developing needed stipulations and protective measures for the Federal land surface, should the state decide to develop the coal. Table A3-2 and Table A3-3 provide a summary of the Federal surface/state coal lands affected by the coal screening process.

TABLE A3-2

SUMMARY OF 1992 APPLICATION OF COAL UNSUITABILITY SCREENING (acres)

Area	Federal Surface/ Federal Coal	State Surface/ Federal Coal	Private Surface/ Federal Coal	Federal Surface/ State Coal	PRLA	Total
Coal Development Potential Area (Total)	433,111	82	11,860	30,382	0	575,535
Unsuitability Criterion 1 (Cities/Towns)	678	0	1,594	386	0	2,658
Unsuitability Criterion 2 (I-80 & UPRR	)856	0	160	51	0	1,067
Unsuitability Criterion 3 (Dwelling Buffer)[1]	0	0	0	0	0	0

TABLE A3-2 (Continued)

SUMMARY OF 1992 APPLICATION OF COAL UNSUITABILITY SCREENING (acres)

Area	Federal Surface/ Federal Coal	State Surface/ Federal Coal	Private Surface/ Federal Coal	Federal Surface/ State Coal	PRLA	Total
Unsuitability Criterion 4 (WSAs)	4,294	0	0	575	0	4,869
Unsuitability Criterion 5 (Scenic Federal Lands)	0	0	0	0	0	0
Unsuitability Criterion 6 (Scientific Studies)	0	0	0	0	0	0
Unsuitability Criterion 7 (Sites on the National Register of Historic Places)	0	0	0	0	0	0
Unsuitability Criterion 8 (Natural Areas or National Natural Landmarks)	0	0	0	0	0	0
Unsuitability Criterion 9 (Threatened or Endangered Plant and Animal Species)	0	0	0	0	0	0
Unsuitability Criterion 10 (State Listed Animal Species and Plant Species)	0	0	0	0	0	0
Unsuitability Criterion 11 (Bald or Golden Eagle Nest)	0	0	0	0	0	0
Unsuitability Criterion 12 (Bald and Golden Eagle Roost and Concentration Areas)	0	0	0	0	0	0

TABLE A3-2 (Continued)

SUMMARY OF 1992 APPLICATION OF COAL UNSUITABILITY SCREENING (acres)

Area	Federal Surface/ Federal Coal	State Surface/ Federal Coal	Private Surface/ Federal Coal	Federal Surface/ State Coal	PRLA	Total
Unsuitability Criterion 13 (Falcon Cliff Nesting Site)	0	0	0	0	0	0
Unsuitability Criterion 14 (High Priority Habitat for Migratory Bird Species)	0	0	0	0	0	0
Unsuitability Criterion 15 (Species of State High Interest)	0	0	0	0	0	0
Unsuitability Criterion 16 (Floodplains- estimated)	1,938	25	160	0	12	2,135
Unsuitability Criterion 17 (Watersheds)	1,862	0	2	0	0	1,864
Unsuitability Criterion 18 (National Resource Waters)	0	0	0	0	0	0
Unsuitability Criterion 19 (Alluvial Valley Floors)	0	0	0	0	0	0
Unsuitability Criterion 20 (Lands Identified by an Indian Tribe)	0	0	0	0	0	0
TOTAL Area Unsuitable	**9,628**	**25**	**1,916**	**1,012**	**12**	**12,593**
REMAINING Area Acceptable For Further Leasing Consideration	423,570	57	9,944	29,370	0	463,942

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[1] Actual acreages are unknown.

TABLE A3-3

SUMMARY OF OTHER ACREAGES AND TONNAGES AFFECTED BY THE 1992 SCREENING PROCESS

Area	Competitive Federal Coal Areas		Federal Surface/ State Coal Areas		PRLAs	
	Acres	Tonnages[1] (millions)	Acres	Tonnages[1] (millions)	Acres	Tonnages[1] (millions)
Eagle Nest Buffer Zones (estimated)	21,995	373.9	2,245	3.8	0	0
Falcon Nest Buffer Zones (estimated)	11,092	188.6	890	15.1	0	0
Migratory Bird Habitat - Raptor Nest & Buffer Zones (estimated)	65,602	1,115.2	6,087	103.5	15	0.3
Antelope Crucial Winter Range	108,167	1,838.8	7,340	124.8	0	0
Elk Crucial Winter Range	30,978	526.6	702	11.9	0	0
Elk Calving	13,378	227.4	0	0	0	0
Deer Crucial Winter Range	128,146	2,178.5	4,887	83.1	8,670	14.9
Deer Parturition	7,011	119.2	0	0	0	0
Sage Grouse (¼ mile buffer)	667	11.3	0	0	0	0
Sage Grouse (2-mile buffer)	41,455	704.7	3,639	61.8	180	0.3
Streams (500' buffer)	12,660	215.2	495	8.4	750	1.3
Wetlands and Floodplains (rough estimate)	1,789	30.4	111	1.9	0	0

[1] Coal tonnage figures are based upon an average 17,000 tons per acre, where both surface and subsurface mining are affected.

Note: No Federal Surface/Private Minerals lands exist in the Coal Development Potential Area.

FINDINGS

The following is a summary of the findings and related recommendations resulting from conducting the coal screening process.

Refer to Table(s) A3-2 and A3-3 for a summary of acreages and coal tonnages affected by the screening process findings.

Additional documentation and background information, explaining in detail how the procedures were used and the findings were derived are available for public review at the BLM Rock Springs District and Green River Resource Area offices.

Step 1 - Identification of Coal Development Potential

The areas of known and assumed coal development potential are shown on Map 82.

Step 2 - Application of Coal Unsuitability Criteria

Criterion Number 1. Federal Land Systems.

The Federal coal lands and he Federal surface/State coal lands, within the incorporated limits of the towns of Rock Springs and Superior, were determined to be unsuitable for coal mining and related surface operations and impacts:

Criterion Number 2. Rights-of-Way and Easements.

Only those Federal coal lands and Federal surface/State coal lands along the Interstate 80 and Union Pacific Railroad rights-of-way, were determined to be unsuitable for coal mining and related surface operations and impacts because coal development would create significant conflicts with these rights-of-way.

Most of the rights-of-way crossing the coal development potential area can be relocated to accommodate coal mining and related activities. Thus, a "general" determination was made that most right-of-way areas would be acceptable for coal development, subject to valid existing rights and negotiations for relocating if necessary, appropriate stipulations and consistency with current planning and management decisions. Any unforeseen conflicts in these areas should be identified and resolved during the coal activity planning process, during processing of individual coal lease applications, or in mining and reclamation plan development.

Criterion Number 3. Buffer Zones for Rights-of-Way, Communities, & Buildings.

There are no occupied dwellings, cemeteries, schools, churches, community or institutional buildings, or public parks on BLM administered public land surface in the coal development potential area. However, there may be some of these structures and facilities on split estate lands (i.e., private/state surface over Federal coal) and on non-Federal lands that may be located within 100 to 300 feet of adjacent Federal coal lands. Thus, it was determined that a 100-foot buffer zone around a cemetery and a 300-foot buffer zone around occupied dwellings, public buildings, schools, churches, community or institutional buildings, or public parks would be unsuitable for coal mining and related surface operations and impacts. Should any conflicts arise, it would be the responsibility of the lessee to show that conflicts between mining and the buffer zone would be adequately addressed and mitigated to the satisfaction of both parties.

Because the numbers and locations of these structures and facilities and the affect they may have on the development of Federal coal is so variable and unpredictable, it was not possible to make a reasonable estimate of acreage and coal tonnage that may be affected. These situations will be addressed on a case-by-case basis in the course of processing coal lease applications and coal activity planning, prior to issuing Federal coal leases, and during mine plan approval.

It was determined that a buffer area for rights-of-way is unnecessary.

Criterion Number 4. Wilderness Study Areas.

Those parts of the Sand Dunes and Red Creek Badlands WSAs that are within the coal development potential area were determined to be unsuitable for coal mining and related surface operations and impacts, as long as they are under review by Congress for possible wilderness designation. Both Federal coal lands and Federal surface/State coal lands are involved.

Criterion Number 5. Scenic Areas.

No areas were determined to be unsuitable under this criterion. No Class I visual resource areas have been designated within the coal development potential area.

Criterion Number 6. Lands Used For Scientific Study.

No areas were determined to be unsuitable under this criterion. There are no scientific study areas within the coal development potential area.

Criterion Number 7. Historic Lands and Sites.

No areas were determined to be unsuitable under this criterion.

Sites on public lands that were reviewed include: Natural Corrals, Overland Trail, Cedar Canyon Petroglyphs, two sections in Pine Canyon containing petroglyphs, Crookston Ranch, North and South Table Mountains, and the historic mining towns of Gibraltar, Gunn, and Hallville.

Sites on private lands (i.e., split estate, private surface/Federal coal) that were reviewed include: Point of Rocks Stage Station, South Superior Union Hall, Rock Springs City Hall, Reliance School, and Gras House.

All identified cultural sites (including any eligible for or listed on the NRHP) that may be included within a Federal coal lease or that may be affected by coal mining, could be mitigated by avoidance, documentation, excavation, or other mitigation as determined by BLM to enhance or protect the cultural resource values. Surveys for cultural resources would be done during coal activity planning, processing of individual coal lease applications, during mine plan approval processing, and during the term of the lease and mine-life.

Criterion Number 8. National Natural Landmarks.

No areas were determined to be unsuitable under this criterion.

There are no designated National Natural Landmarks within the coal development potential area.

Criterion Number 9. Federally Listed Endangered Species Habitat.

No areas were determined to be unsuitable under this criterion.

There is no endangered species habitat within the coal development potential area.

Criterion Number 10. State Listed Endangered Species Habitat.

No areas were determined to be unsuitable under this criterion.

The State of Wyoming recognizes the Federal list of endangered species and has no separate list of its own.

Criterion Number 11. Bald and Golden Eagle Nest Sites.

No areas were determined to be unsuitable under this criterion.

It was determined that these areas would be acceptable for coal development with a provision that any Federal coal lease issued in the area will include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species involved.

The requirement (or lease stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement/development/reclamation plans (in conjunction with mining and reclamation plan requirements) in consultation with and to the satisfaction of BLM, the USFWS and the appropriate State agencies. Mitigation measures may include but would not be limited to such things as seasonal operations in buffer zones around "occupied" nests, protection of "active" (not necessarily occupied) nests at all times (unless otherwise provided by the USFWS), off or on site habitat improvement or development, special reclamation measures, or other appropriate measures for long-term nest or habitat protection.

Criterion Number 12. Bald and Golden Eagle Roosts.

No areas were determined to be unsuitable under this criterion.

It was determined that these areas would be acceptable for coal development with a provision that any Federal coal lease issued in the area will include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species involved.

The requirement (or lease stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement/development/reclamation plans (in conjunction with mining and reclamation plan requirements) in consultation with and to the satisfaction of BLM, the USFWS and the appropriate State agencies. Mitigation measures may include but would not be limited to such things as seasonal operations in roosting areas and the buffer zones around them, special reclamation measures or other appropriate measures for long-term nest or habitat protection.

Criterion Number 13. Falcon Cliff Nesting Sites.

No areas were determined to be unsuitable under this criterion.

It was determined that these areas would be acceptable for coal development with a provision that any Federal coal lease issued in the area will include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species involved.

The requirement (or lease stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement/development/reclamation plans (in conjunction with mining and reclamation plan requirements) in consultation with and to the satisfaction of BLM, the USFWS and the appropriate State agencies. Mitigation measures may include but would not be limited to such things as seasonal operations in buffer zones around “occupied” nests, protection of “active” (not necessarily occupied) nests at all times (unless otherwise provided by the USFWS), off or on site habitat improvement or development, special reclamation measures, or other appropriate measures or long-term nest or habitat protection.

Criterion Number 14. Migratory Bird Habitat.

No areas were determined to be unsuitable under this criterion.

It was determined that these areas would be acceptable for coal development with a provision that any Federal coal lease issued in the area will include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species involved.

The requirement (or lease stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement/development/reclamation plans (in conjunction with mining and reclamation plan requirements) in consultation with and to the satisfaction of BLM, the USFWS and the appropriate State agencies. Mitigation measures may include but would not be limited to such things as seasonal operations in buffer zones around “occupied” nests and other important habitat areas, protection of “active” (not necessarily occupied) nests at all times (unless otherwise provided by the USFWS), off or on site habitat improvement or development, special reclamation measures, or other appropriate measures for long-term nest or habitat protection.

Criterion Number 15. Habitat for State High-Interest Wildlife and Plants.

No areas were determined to be unsuitable under this criterion.

The primary habitat considerations involved with the coal development potential area are big game crucial winter ranges, elk calving areas, sage grouse leks and nesting areas, and burrowing owl nesting areas. It was determined that these areas would be acceptable for coal development with a provision that any Federal coal lease issued in the area will include a requirement for developing appropriate mitigation measures that would protect the long-term interests of the species and habitats involved.

The requirement (or lease stipulation) would be to the effect that the lessee would be required to develop mitigation measures or habitat improvement/development/reclamation plans (in conjunction with mining and reclamation plan requirements) to the satisfaction of BLM and the appropriate State agencies. Mitigation measures may include but would not be limited to such things as seasonal operations in some areas, off or on site habitat improvement or development, special reclamation measures, or other appropriate measures for long-term habitat protection.

Greater Cooper Ridge

The greater Cooper Ridge and Elk Butte areas (about 25,765 acres and 438 million tons of coal) was determined to be acceptable for further consideration for

Federal coal leasing and development, pending further study. This study is for the purpose of defining the extent of any deer and antelope crucial winter range in the area, and for determining if certain methods of coal mining can occur in the area without having a significant long-term impact on the deer and antelope herds. About 395 acres of State coal lands would be affected.

Sage Grouse

Active grouse leks (sage and sharptail) and the area within ¼ mile radius of active leks (about 667 acres and 11.3 million tons of coal) were determined to be acceptable for coal development provided that (1) the related surface disturbing activities avoid the areas, if possible, and where not possible, intensive mitigation were applied; (2) Permanent and high profile structures, such as buildings, overhead powerlines, other types of ancillary facilities, etc., were prohibited in these areas; and (3) During the grouse mating season, surface uses and activities were prohibited between the hours of midnight and 9:00 a.m., within ½ mile radius of the leks.

Criterion Number 16. Riverine, Coastal, and Special Floodplains.

The floodplains of Bitter Creek and Salt Wells Creek were determined to be unsuitable for coal mining and related surface operations and impacts.

It was determined that most of the identified floodplain areas can be mined in such a manner that all or certain stipulated methods of coal mining can be undertaken without substantial threat of loss to people or property and to the natural and beneficial values of the floodplain, either on a coal lease tract or downstream. Examples of lease requirements may include but are not limited to relocation of channels during mining and restoration of channel locations after mining, controlling sediment yields and prohibiting spoil dumping in channels, lining channel bottoms, revegetation and general mined land reclamation, etc.

Riparian Areas and Wetlands (incomplete data).

Riparian and wetland habitat areas (about 2,000 acres and 34 million tons of coal) were determined to be acceptable for coal development with avoidance or adequate mitigation of surface disturbing activities. These areas would be managed as avoidance areas for surface disturbing activities. That is, surface disturbing activities associated with such actions as surface coal mining methods, exploration drilling, construction of roads and other types of rights-of-way, etc., would be avoided in these areas, if possible. In cases where it is not possible to avoid these areas, intensive mitigation of the surface disturbing activities would be emphasized.

Criterion Number 17. Municipal Watersheds.

The Federal coal lands within the municipal watershed for the Town of Superior were determined to be unsuitable for coal mining and related surface operations and impacts.

These lands are a part of the surface outcrop of the Ericson Formation and the associated recharge area, in the area northeast of Superior. The Town of Superior obtains its drinking water from wells drilled into the Ericson Formation.

Criterion Number 18. National Resource Waters.

No areas were determined to be unsuitable under this criterion.

No National Resource Waters, within the coal development potential area, have been identified by the State in its water quality management plan.

Criterion Number 19. Alluvial Valley Floors.

No areas were determined to be unsuitable under this criterion.

No alluvial valley floors have been identified by the State of Wyoming or by BLM within the coal development potential area.

Criterion Number 20. Unsuitability Criterion Proposed by a State or by an Indian Tribe.

No areas were determined to be unsuitable under this criterion.

Neither the State of Wyoming nor any Indian Tribes have proposed any unsuitability criteria to the Secretary.

The Eastern Shoshone Tribe has expressed concern that areas of interest to them for religious or spiritual reasons may be within the coal development potential area. They have not visited the area to address specific concerns and would like to reserve the right to comment concerning specific areas proposed for coal leasing. The Uintah-Ouray (Ute), Bannock-Northern Shoshone and Northern Arapahoe tribes have also been consulted but have not provided comments.

Prior to coal leasing, the tribes that are known to have inhabited the lands in and near the planning area in the historic past will be solicited for comments.

Summary of Results of Application of the Unsuitability Criteria

Approximately 12,600 acres of public lands within the coal development potential area (containing approximately 225 million tons of coal) were determined to be unsuitable for coal mining and related surface operations and impacts (Map 83). Areas found to be unsuitable include incorporated towns, the rights-of-way for Interstate 80 and the Union Pacific Railroad, WSAs, floodplains, and the Town of Superior municipal watershed recharge area.

Federal surface State Coal lands affected by the unsuitability determinations are listed in Table A3-2.

Step 3 - Multiple Use Conflicts

In this step of the coal screening process, those lands which were determined to be acceptable for coal development after applying the coal unsuitability criteria, remained acceptable for further leasing consideration and were further evaluated. This evaluation involved consideration of other multiple use values (i.e., not concerned with the unsuitability criteria) and identifying any additional areas that would be "unacceptable" for coal mining or related surface operations and impacts.

This evaluation of other multiple use conflicts involves a somewhat complicated procedure of sequentially analyzing and developing the various coal management scenarios, presented in the alternatives of the RMP EIS, as follows:

1. The analysis of the coal management actions for Alternative A (continuation of existing management direction or the "No Action" alternative), described in Chapter 2 of this EIS, is documented in Chapter 4. The results of the other multiple use conflict evaluation of this alternative for coal screening is summarized in Appendix 3-1. As pointed out earlier, the coal management actions for Alternative A are the same as those developed in 1981, and were provided for purposes of comparative analysis only. The 1981 coal management decisions and the data they were based on are now outdated and inadequate and will be superseded by the 1992 coal screening application and the approved Green River RMP.

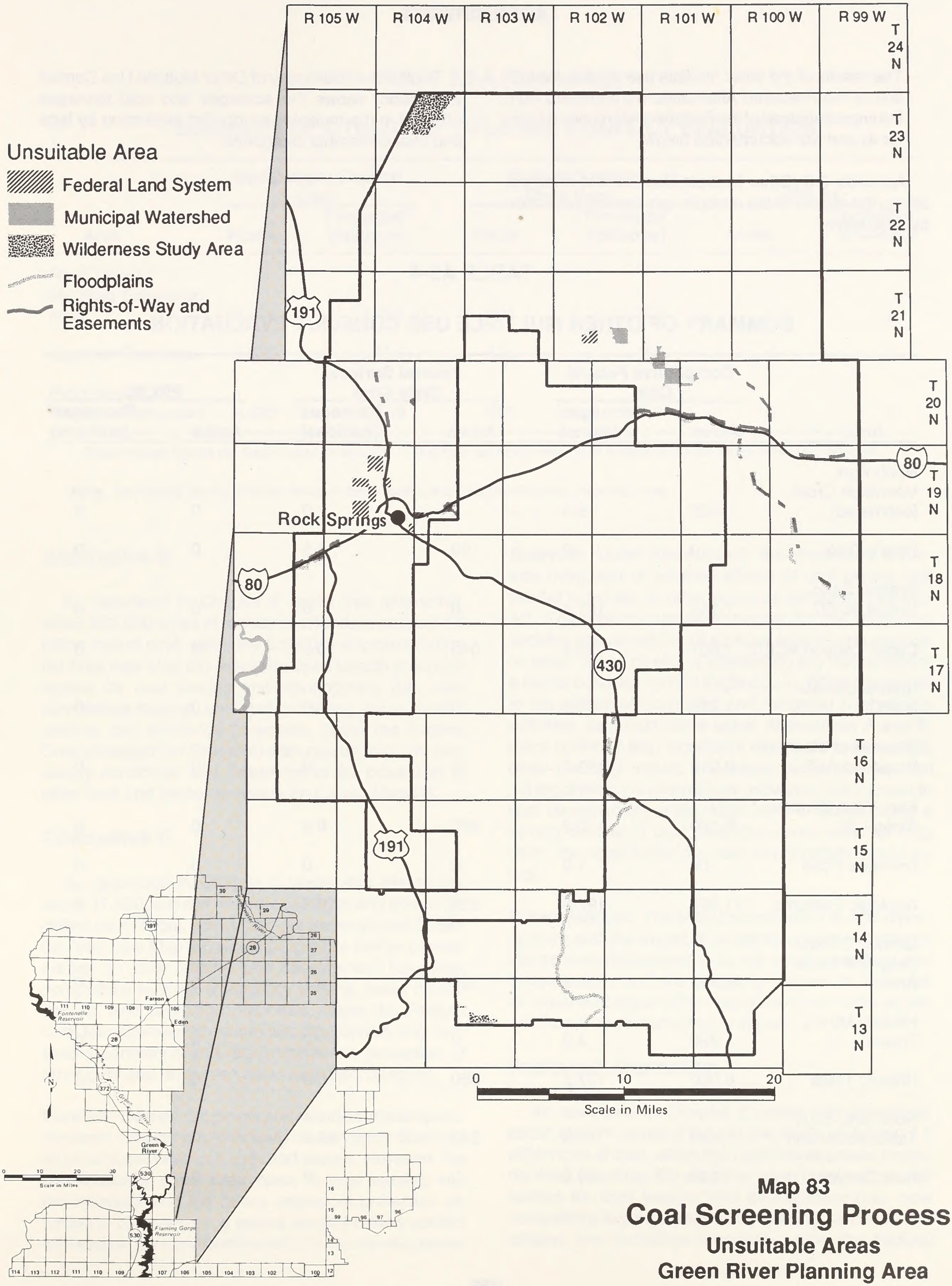
2. Based on the results of the 1992 application of the coal unsuitability criteria on the coal development potential area (documented above), the coal management scenario for Alternative B was developed (see Chapter 2). A basic assumption of the coal management scenario for Alternative B was that, with very few exceptions, any conflicts or impacts to other multiple use values that may be caused by coal mining and related surface operations and impacts could be mitigated or would be allowable. Thus, the exceptions to the bulk of the unsuitability criteria would be applicable and requirements for environmental protection would be minimal.

   The results of the other multiple use conflict evaluation of Alternative B are documented below. They were derived from the impact analysis of Alternative B (Chapter 4).

3. Based on the results of both the application of the unsuitability criteria and the impact analysis of Alternative B, the coal management scenario for Alternative C was developed (see Chapter 2). To provide a good basis for comparative impact analysis, a basic assumption for the Alternative C coal scenario was that most conflicts or impacts to other multiple use values that may be caused by coal mining and related surface operations and impacts could not be mitigated or would not be allowable. Thus, the exceptions to the bulk of the unsuitability criteria would not be applicable and requirements for environmental protection would be heavy to extreme.

   The results of the other multiple use conflict evaluation of Alternative C were derived from the impact analysis of Alternative C (Chapter 4) and are documented below.

4. In addition to the results of the application of the unsuitability criteria, the coal management scenario for the Preferred Alternative (see Chapter 2) was also based on the comparative analyses and other multiple use conflict evaluations of both Alternatives B and C. That is, the coal management scenario for the Preferred Alternative was developed to strike a happy medium between any excessive or unnecessary impacts to other resource and land use values that may result from Alternative B and any excessive or unnecessary impacts to coal development that may result from Alternative C.



Map 83

Coal Screening Process:

Unsuitable Areas

Green River Planning Area

APPENDIX 3-2

The results of the other multiple use conflict evaluation of the Preferred Alternative were derived from the impact analysis of the Preferred Alternative (Chapter 4) and are documented below.

Appendix 3-3 (Other Multiple Use Conflict Analysis) shows the results of the multiple use conflict evaluation by alternative.

Table A3-4 (Summary of Other Multiple Use Conflict Evaluation) shows the acreages and coal tonnages affected in the multiple use conflict evaluation by land and coal ownership categories.

TABLE A3-4

SUMMARY OF OTHER MULTIPLE USE CONFLICT EVALUATION

	Competitive Federal Coal		Federal Surface/ State Coal		PRLAs	
Area	Acres	Tonnages[1] (millions)	Acres	Tonnages[1] (millions)	Acres	Tonnages[1] (millions)
North Fork Vermillion Creek (estimated)	405	6.9	0	0	0	0
Boar's Tusk	0	0	90	1.5	0	0
Greater Sand Dunes ACEC	7,140	121.4	0	0	0	0
Cedar Canyon ACEC	1,907	32.4	643	10.9	0	0
Natural Corrals ACEC	1,275	21.7	0	0	0	0
Steamboat Mountain Proposed ACEC	9,510	161.7	0	0	0	0
East-West Window Along I-80	6,480	110.2	400	6.8	0	0
Emmons Cone	60	1.0	0	0	0	0
Geologic Features	11,634	197.8	636	10.8	0	0
Greater Cooper Ridge/Elk Butte Area	25,368	431.3	395	6.7	0	0
Historic Mining Towns	290	4.9	0	0	0	0
Historic Trails	8,090	137.5	350	5.9	0	0
North and South Table Mountains	640	10.9	640	10.9	0	0
Pine Canyon	1,280	21.8	0	0	0	0

TABLE A3-4 (Continued)

SUMMARY OF OTHER MULTIPLE USE CONFLICT EVALUATION

Area	Competitive Federal Coal		Federal Surface/ State Coal		PRLAs	
	Acres	Tonnages[1] (millions)	Acres	Tonnages[1] (millions)	Acres	Tonnages[1] (millions)
Rock Springs Modified Expansion Area	10,005	170.1	191	3.2	0	0
Superior Recharge	4,580	77.9	130	2.2	0	0
Proposed ACEC Tri-State Monument	8,995	152.9	655	11.1	0	0

[1] Coal tonnage figures are based upon an average 17,000 tons per acre, where both surface and subsurface mining are affected.

Note: No Federal Surface/Private Minerals lands exist in the Coal Development Potential Area.

Alternative B

As described in Chapter 2 under this alternative, about 463,000 acres of federal coal lands and about 7.5 billion tons of coal, within the Coal Development Potential Area (see Map 82) would be open to further consideration for coal leasing and development (i.e., new competitive leasing, emergency leasing, lease modifications, and exchange proposals, under the Federal Coal Management Program) with appropriate and necessary conditions and requirements for protection of other land and resource values and uses (Map84).

Alternative C

As described in Chapter 2 under this alternative, about 47,000 acres of federal coal lands and about 799 million tons of coal, within the Coal Development Potential Area (see Map 82) would be open to further consideration for coal leasing and development (i.e., new competitive leasing, emergency leasing, lease modifications, and exchange proposals, under the Federal Coal Management Program) with appropriate and necessary conditions and requirements for protection of other land and resource values and uses (Map85).

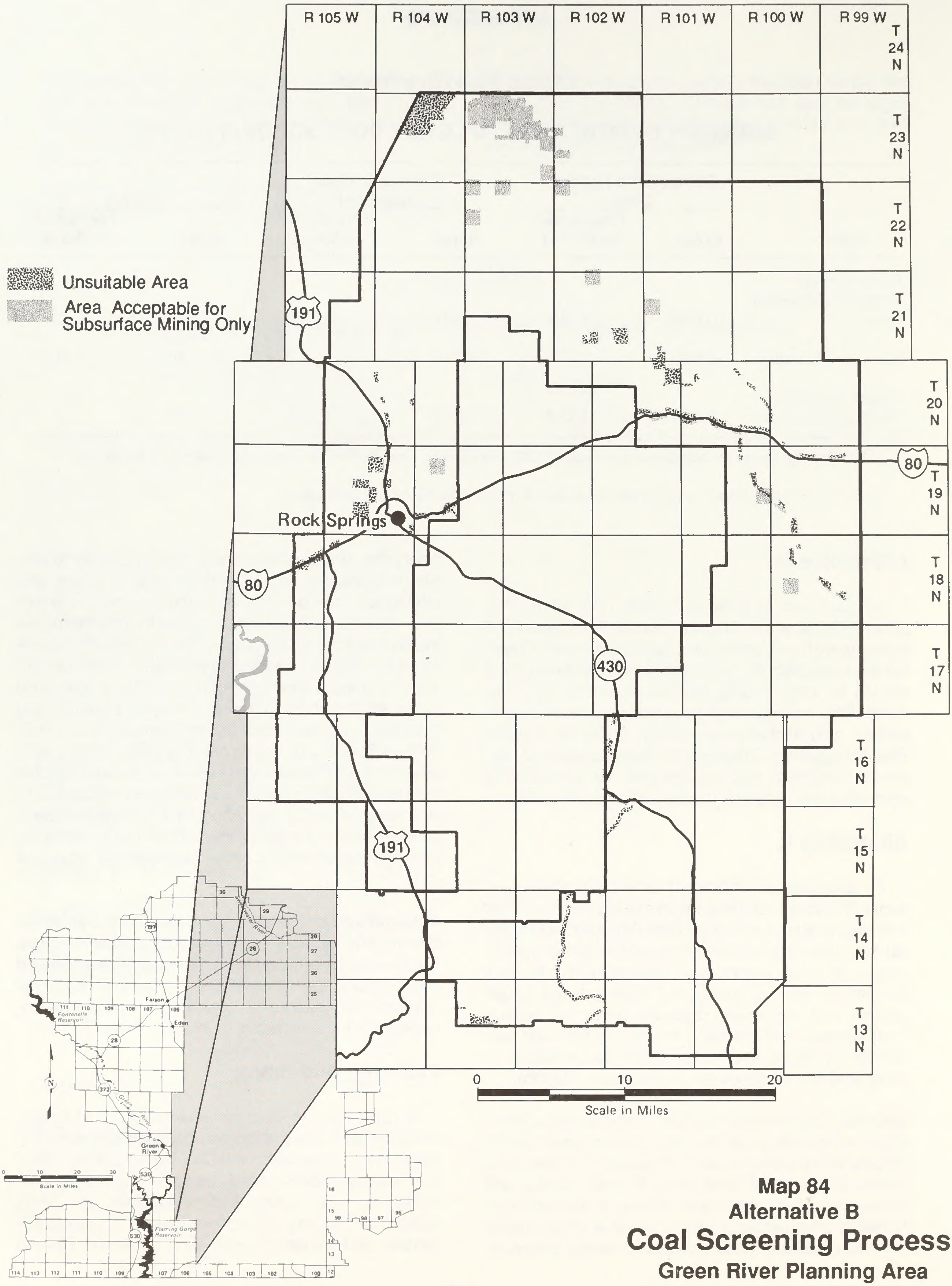
Conflict: Coal development and related surface operations and impacts would virtually cause no conflicts with other land and resource uses and values. However, the comparatively small area open to coal leasing and development and the heavy degree of protection afforded to other resource values would severely conflict with and cause significant impacts to coal development.

Analysis: Under Alternative C, the opportunity to provide mitigation of adverse affects of coal mining and related activities on other resource values is nonexistent. The coal management scenario for this alternative avoided any possibility of adverse coal mining impacts on other values by simply disallowing any mining where a real or potential conflict might occur. When compared to the affects of controlled and mitigated coal mining activities, as would occur under Alternatives A and B, there is little, if any, significant difference in impacts to other resource values that would be caused by coal mining among the alternatives. However, the impacts to coal development under Alternative C would cause a severe decline in coal production and, over the long term, the opportunity for coal development would be lost.

Determination: The extent of restriction to coal development and the extent of protection of other resource values were determined to be extremely excessive and unnecessary, and the resulting degree of lost coal development opportunity was determined to be an unnecessary and unacceptable impact.

Preferred Alternative

As described in Chapter 2 under this alternative, about 463,000 acres of federal coal lands and about 7.1 billion tons of coal, within the Coal Development Potential Area (see Map 82) would be open to further consideration for coal leasing and development (i.e., new competitive leasing, emergency leasing, lease modifications, and exchange proposals, under the Federal

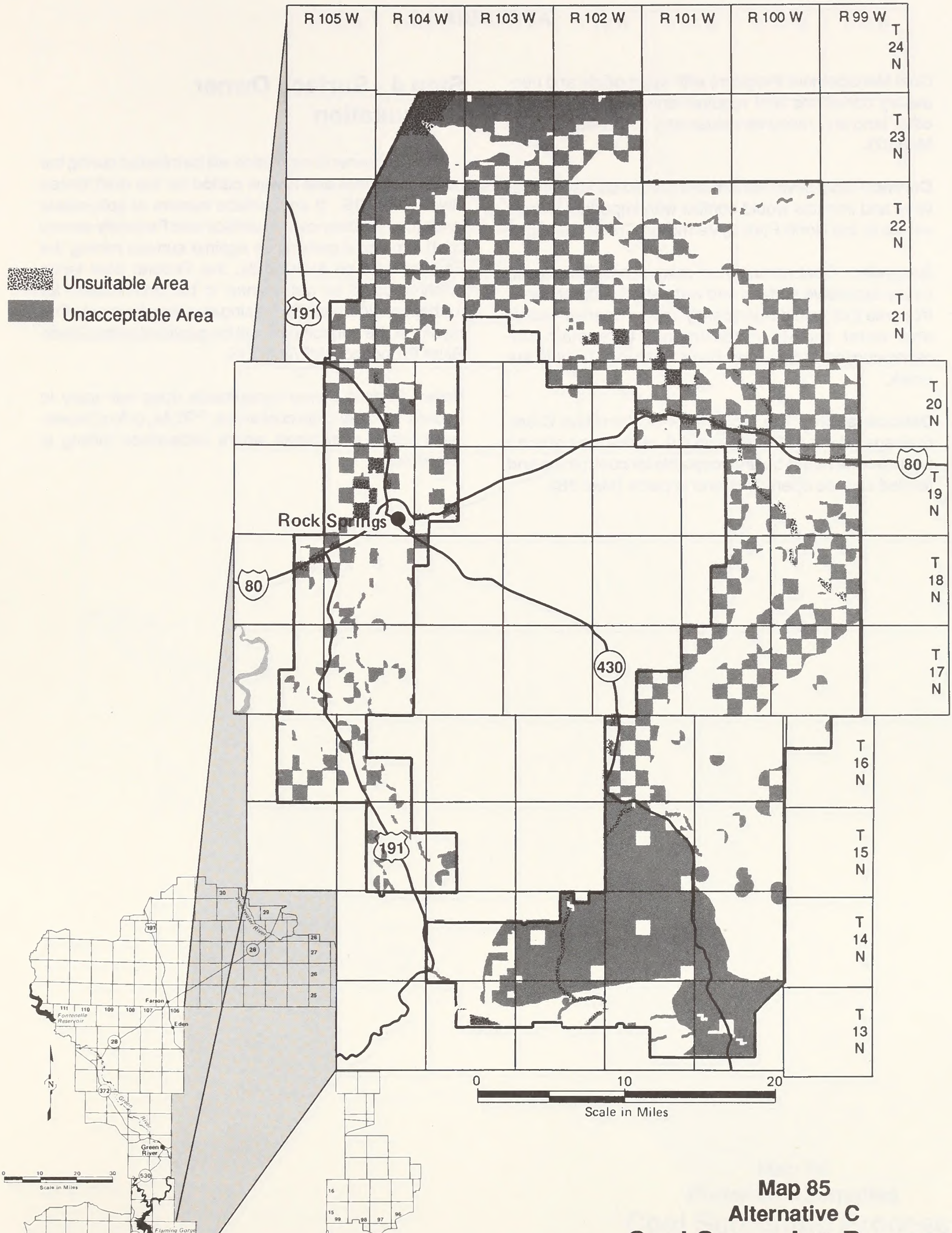


Map 84

Alternative B

Coal Screening Process:

Green River Planning Area



Map 85
Alternative C
Coal Screening Process:
Green River Planning Area

Coal Management Program) with appropriate and necessary conditions and requirements for protection of other land and resource values and uses (Map 86 and Map 87).

Conflict: Coal development and related surface operations and impacts would conflict with important wildlife values in the North Fork of Vermillion Creek drainage.

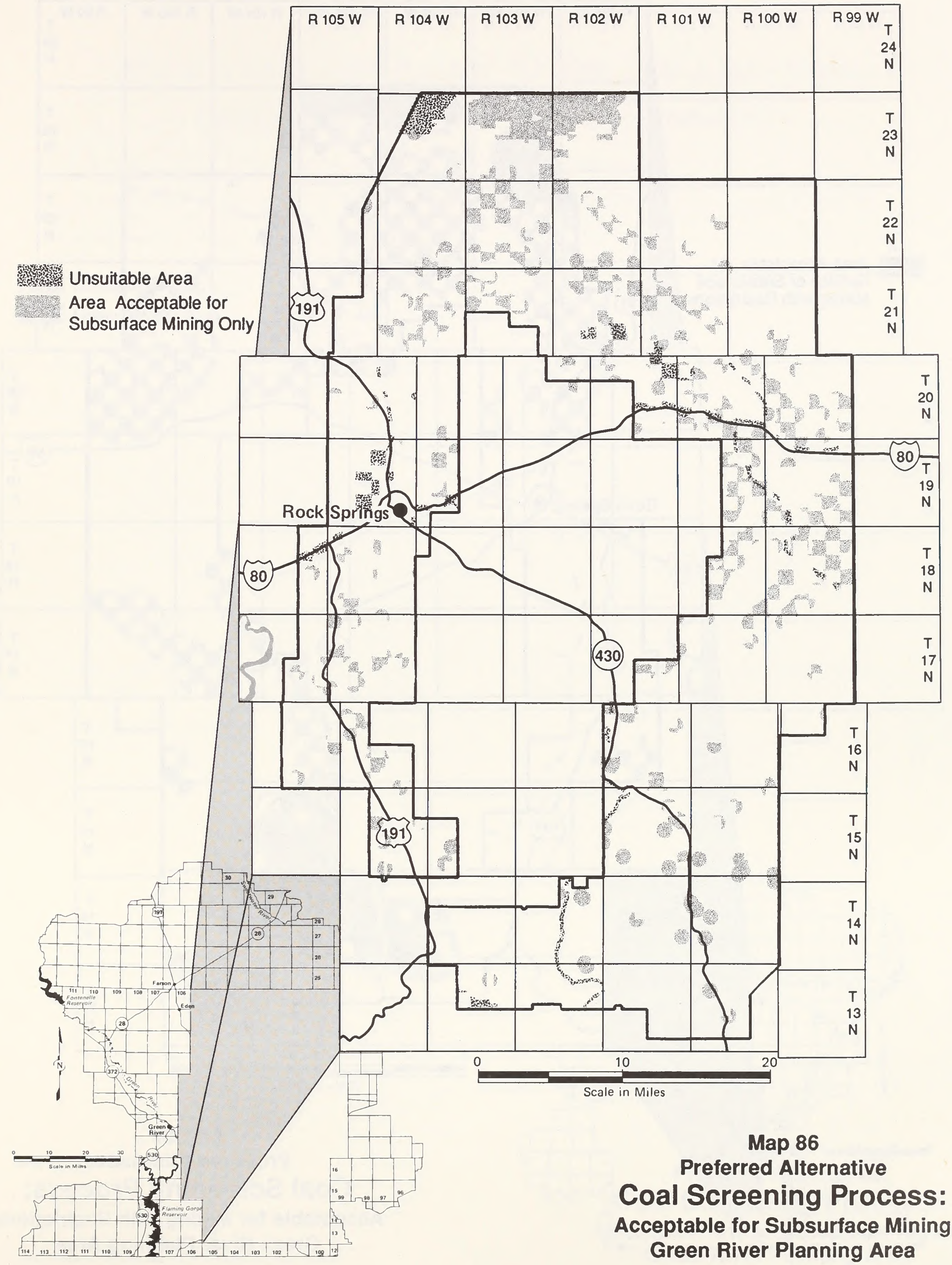
Analysis: Coal mining and related activities would cause excessive surface and watershed disturbance in this area that would significantly impact riparian habitat and water quality requirements to sustain the reintroduction of Colorado River Cutthroat Trout in the creek.

Determination: The North Fork of Vermillion Creek drainage (about 405 acres and 6.9 million tons of coal) were determined to be unacceptable for coal mining and related surface operations and impacts (Map 88).

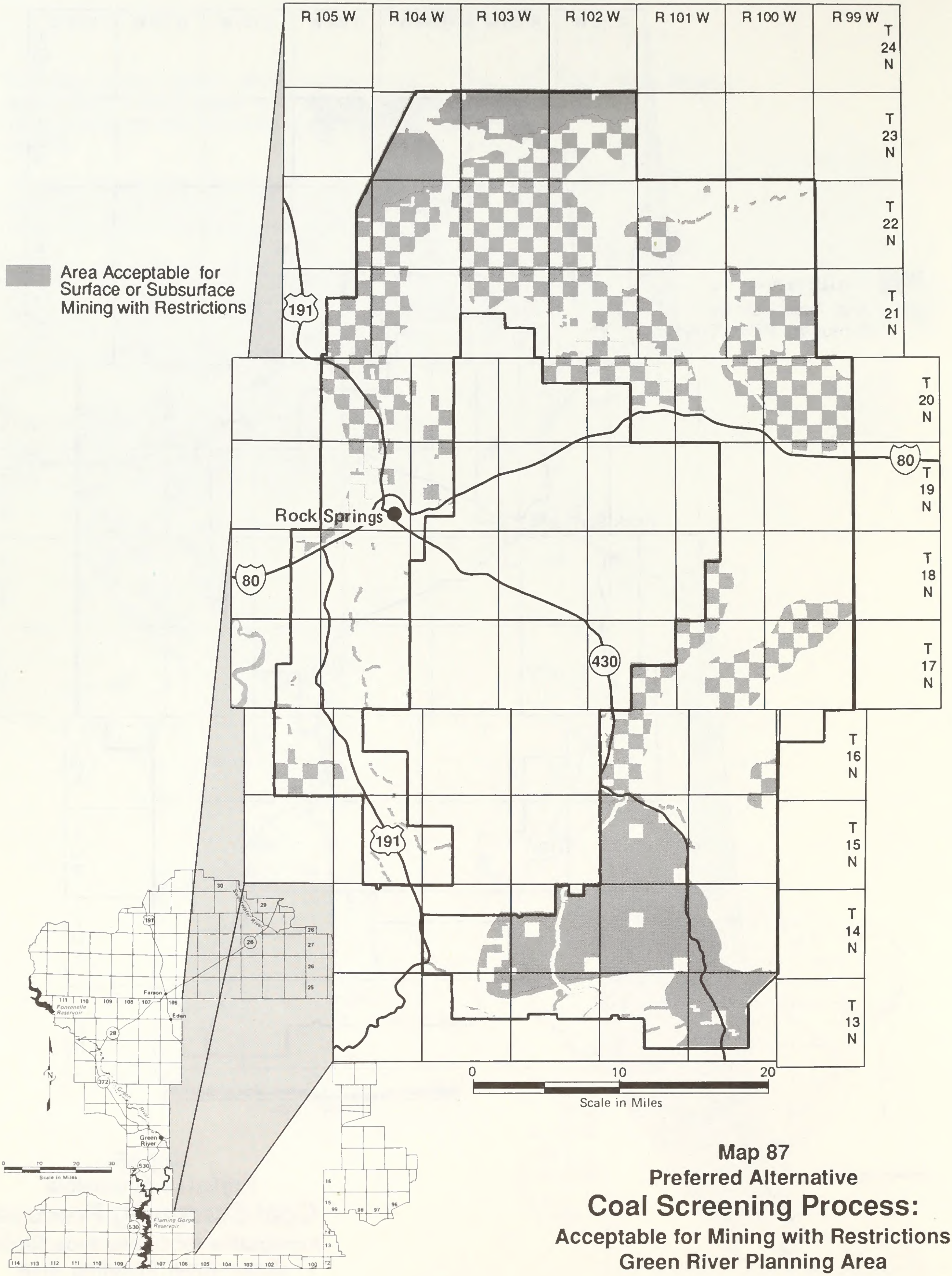
Step 4 - Surface Owner Consultation

Surface owner consultation will be initiated during the public comment and review period for the draft Green River RMP EIS. If any surface owners of split-estate lands (i.e., privately-owned surface over Federally-owned coal) express a preference against surface mining the Federal coal on their lands, the Federal coal lands involved could be determined to be "unavailable" for further consideration for leasing and development. The results of the consultation will be provided in the Green River Proposed RMP/final EIS.

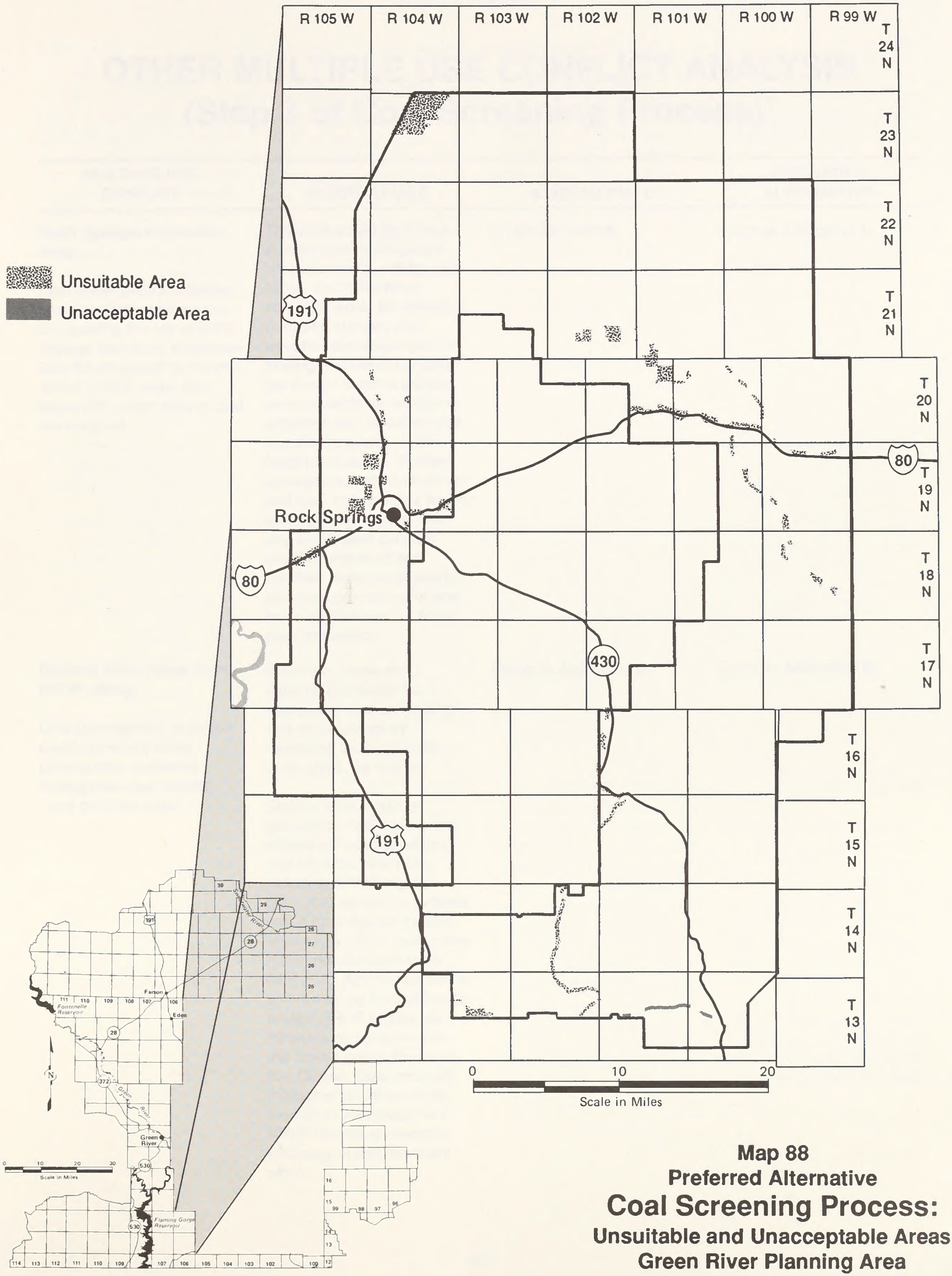
Note: Surface owner consultation does not apply to Federal surface/State coal areas, PRLAs, or to competitive Federal coal areas where subsurface mining is concerned.



Map 86
Preferred Alternative
Coal Screening Process:
Acceptable for Subsurface Mining
Green River Planning Area



Map 87
Preferred Alternative
Coal Screening Process:
Acceptable for Mining with Restrictions
Green River Planning Area



Map 88
Preferred Alternative
Coal Screening Process:
Unsuitable and Unacceptable Areas
Green River Planning Area

APPENDIX 3-3

OTHER MULTIPLE USE CONFLICT ANALYSIS (Step 3 of Coal Screening Process)[1]

MULTIPLE USE CONFLICT	ALTERNATIVE B	ALTERNATIVE C	PREFERRED ALTERNATIVE
Rock Springs Expansion Area: Coal development activities could conflict with the area surrounding the city of Rock Springs that could accommodate future growth of the city. About 12,200 acres and about 207 million tons of coal are involved.	This area would be acceptable for coal development provided health, safety, well being, and subsidence concerns would be mitigated. A leasing strategy plan would be developed prior to leasing and would consider the design of lease parcels, areas acceptable for mining activities, and would provide direction to protect public health and safety. Further consultation with landowners and local communities would occur prior to leasing and any unforeseen conflicts could be identified and resolved during coal activity planning, processing of coal lease applications, or mine plan preparation.	No similar conflict.	Same as Alternative B.
Cultural Sites (other than NRHP sites): Coal development activities could adversely affect cultural sites scattered through the coal development potential area.	Generally, these other cultural sites would be acceptable for coal leasing and development by managing them as avoidance areas, as follows: Cultural sites would be avoided by coal mining and related surface operations and impacts. Any sites, including NRHP eligible sites, that cannot be avoided would be mitigated by data recovery or other appropriate measures pursuant to 36 CFR 800. Appropriate buffer zones may be established to protect NRHP eligible sites following consultation with the State Historic Preservation Officer. Data recovery measures would be implemented in the context of a NRHP District to maximize efficiency of data recovery effort.	Same as Alternative B.	Same as Alternative B.

MULTIPLE USE CONFLICT	ALTERNATIVE B	ALTERNATIVE C	PREFERRED ALTERNATIVE
Cultural Sites (other than NRHP sites): (continued)	The following areas, involving about 3,470 acres and about 29.3 million tons of coal, would be acceptable for coal development by subsurface mining methods only. These same lands would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining:	No similar conflict.	The following areas, involving about 3,930 acres and 33.3 million tons of coal, would be acceptable for coal development by subsurface mining methods only. These same lands would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining:
	Estimated Federal Coal Acreage	Estimated Federal Coal Acreage	Estimated Federal Coal Acreage
	1,280 Portions of the Overland Trail on BLM-administered lands (4 miles x 320 acres/mile)	1,280 Portions of the Overland Trail on BLM-administered lands (4 miles x 320 acres/mile)	1,280 Portions of the Overland Trail on BLM-administered lands (4 miles x 320 acres/mile)
	290 Historic mining towns of Gunn (10), Gibraltar (30), and Hallville (250)	290 Historic mining towns of Gunn (10), Gibraltar (30), and Hallville (250)	290 Historic mining towns of Gunn (10), Gibraltar (30), and Hallville (250)
	40 Crookston Ranch site	500 Crookston Ranch site	500 Crookston Ranch site
	90 Boar's Tusk	90 Boar's Tusk	90 Boar's Tusk
	60 Emmons Cone	60 Emmons Cone	60 Emmons cone
	430 Area in Pine Canyon with sensitive cultural resources.	1,280 Area in Pine Canyon with sensitive cultural resources.	430 Area in Pine Canyon with sensitive cultural resources.
	1,280 Portions of North and South Table Mountains.	1,280 Portions of North and South Table Mountains.	1,280 Portions of North and South Mountains.
Geologic Features: Coal mining activities could conflict with the unique geologic and ecologic features of the Boar's Tusk-Killpecker dune field and Steamboat areas. (about 12,270 acres). The Boar's Tusk-Killpecker Dune Field area, is included within the Greater Sand Dunes ACEC, and the Steamboat area is partially within the proposed Steamboat Mountain ACEC and surrounding area.	The Boar's Tusk-Killpecker Dune Field area would be acceptable for coal development by subsurface mining methods only. This same area would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining (about 1,278 acres and 1 million tons of coal).	No similar conflict.	Same as Alternative B.

APPENDIX 3-3

MULTIPLE USE CONFLICT	ALTERNATIVE B	ALTERNATIVE C	PREFERRED ALTERNATIVE
Geologic Features: (continued)	The Steamboat area (about 10,992 acres and about 93.5 million tons of coal) would be acceptable for coal development by any mining method provided adequate measures are taken to protect the elk herd.	No similar conflict.	The Steamboat area (about 10,992 acres and 93.5 million tons of coal) would be acceptable for coal development by subsurface mining methods only. However, types and placement of surface facilities, activities, etc., related to subsurface mining, would be only allowed on a limited basis. This same area would be unacceptable for surface coal mining methods.
Natural Corrals ACEC: Coal mining activities could conflict with resource values in the Natural Corrals ACEC.	Federal coal lands within Section 18 of the Natural Corrals ACEC (about 640 acres and 5.4 million tons of coal) would be acceptable for coal development by subsurface mining methods only. These same lands would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining.	No similar conflict.	Federal coal lands within the Natural Corrals ACEC (about 1,270 acres and 10.8 million tons of coal) would be acceptable for coal development by subsurface mining methods only. These same lands would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining.
	About 630 acres of federal coal lands and 10.7 million tons of coal within section 12 of the ACEC would be acceptable for coal development by surface and subsurface mining methods, with mitigation requirements to avoid conflicts with raptor nests and crucial big game winter range.	No similar conflict.	No similar conflict.
Petroglyph Sites: Coal mining activities could conflict with petroglyph sites.	The Tolar Petroglyph site (about 20 acres of Federal coal lands and 170,000 tons of coal) would be acceptable for coal development by subsurface mining methods only. These same lands would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining.	The Tolar Petroglyph site (about 500 acres of Federal coal lands and 14.2 million tons of coal) would be acceptable for coal development by subsurface mining methods only. These same lands would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining.	Same as Alternative C.

APPENDIX 3-3

MULTIPLE USE CONFLICT	ALTERNATIVE B	ALTERNATIVE C	PREFERRED ALTERNATIVE
Petroglyph Sites: (continued)	The Cedar Canyon Petroglyph site (about 20 acres of Federal coal lands and 170 tons of coal) would be acceptable for coal development by subsurface mining methods only. These same lands would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining.	No similar conflict.	The Cedar Canyon Petroglyph site (about 500 acres of Federal coal lands and 4.2 million tons of coal) would be acceptable for coal development by subsurface mining methods only. These same lands would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining.
	The remainder of the Cedar Canyon ACEC (about 2,530 acres and 21.5 million tons of coal) would also be acceptable for coal development by subsurface mining methods only and unacceptable for surface coal mining methods. However, types and placement of surface facilities, activities, etc., related to subsurface mining in this area, would be only allowed on a limited basis and seasonal use restrictions would be imposed, if necessary, for the protection of wildlife values.	No similar conflict.	The remainder of the Cedar Canyon ACEC (about 2,050 acres and 17.5 million tons of coal) would also be acceptable for coal development by subsurface mining methods only and unacceptable for surface coal mining methods. However, types and placement of surface facilities, activities, etc., related to subsurface mining in this area, would be allowed on only a limited basis and seasonal use restrictions would be imposed, if necessary, for the protection of wildlife values.
Greater Sand Dunes ACEC: Coal mining activities could conflict with the resource values in the Greater Sand Dunes ACEC.	In the Greater Sand Dunes ACEC, about 7,140 acres of Federal coal lands and 61 million tons of coal would be acceptable for coal development by subsurface mining methods only, provided that the mine entrance and all surface facilities are located away from the ACEC a sufficient distance to screen facilities from view and muffle noise. These same lands would be unacceptable for surface coal mining methods and any surface operations and impacts related to coal mining.	Same as Alternative B.	Same as Alternative B.

APPENDIX 3-3

MULTIPLE USE CONFLICT	ALTERNATIVE B	ALTERNATIVE C	PREFERRED ALTERNATIVE
Tri-State Monument Proposed ACEC: Coal mining activities could conflict with the resource values in the Tri-State Monument area.	About 9,600 acres and 164 million tons of coal would be acceptable for development by surface and subsurface coal mining methods, with certain stipulations. Coal leases and development in the area would include a requirement for plans of development, mining plans, etc., to include adequate mitigation measures to assure protection of the watershed values, prior to allowing any mining activity.	No similar conflict.	About 9,600 acres and 82 million tons of coal would be acceptable for coal development by subsurface mining methods only. However, surface operations and impacts related to subsurface mining would be considered and allowed on a case-by-case and very limited basis. This same area would be unacceptable for surface coal mining methods.
Steamboat Mountain Proposed ACEC: Coal mining activities could conflict with the resource values in the Steamboat Mountain area.	About 9,500 acres of Federal coal lands and 161.5 million tons of coal would be acceptable for coal development by surface and subsurface coal mining methods, with certain stipulations. Coal leases and development in the area would include a requirement for plans of development, mining plans, etc., to include adequate mitigation measures to assure protection and maintenance of the elk herd, prior to allowing any mining activity.	No similar conflict.	About 9,500 acres and 81 million tons of coal would be acceptable for coal development by subsurface mining methods only. However, surface operations and impacts related to subsurface mining would be considered and allowed on a case-by-case and very limited basis. This same area would be unacceptable for surface coal mining methods.
North Fork of Vermillion Creek Drainage: Coal mining activities could conflict with watershed stability and with the Colorado River Cutthroat Trout habitat in the North Fork of Vermillion Creek.	About 405 acres and 7 million tons of coal would be acceptable for coal development by either surface or subsurface mining methods with a requirement to replace any disturbed riparian or wetland areas with areas of equal or better value.	No similar conflict.	No similar conflict.

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[1] Acreages and coal tonnages do not add due to overlapping areas.
[2] Incomplete data.

Coal tonnage figures are based upon an average of 17,000 tons per acre where both surface and subsurface leasing and mining activity are affected and 8,500 acres where either surface or subsurface leasing and mining activity are affected.

APPENDIX 4-1

ANALYSIS OF RIVERS AND STREAMS

As part of the planning effort for developing the Green River Resource Management Plan, BLM team members analyzed all rivers and streams in the resource area to determine their eligibility and potential suitability for inclusion in the National Wild and Scenic Rivers System (WSRS).

Public Involvement and Coordination

Wyoming BLM staff met with representatives of various Wyoming State agencies, including the Governor's Office in January 1991.

A letter describing the Wild and Scenic Rivers process and the Eligibility Criteria were sent to the Green River RMP mailing list to solicit comments and public involvement.

Presentations to local community groups and public outreach included the Bitter Creek White Water Association (2 presentations), Green River Green Belt Task Force, a Fishing Seminar/Workshop, and Trout Unlimited, Flaming Gorge/Lower Green River Chapter.

Briefings were given to the Wyoming Congressional Delegation Representatives, the BLM Rock Springs District Multiple Use Advisory Council, and representatives from the Rock Springs Grazing Association.

Media involvement included a press release in several Wyoming newspapers, 3 radio interviews, and 1 television interview.

Eligibility Criteria

As part of the planning process for developing the Green River Resource Management Plan, BLM planning team members looked at all rivers and streams in the Green River Resource Area to see if they met the National Wild and Scenic River Act criteria for eligibility to be included in the WSRS. Only rivers/streams or segments of rivers/streams flowing through Federal lands (i.e., public lands) administered by the BLM were considered.

To be eligible for inclusion in the WSRS, a river (or river segment) must be "free-flowing" and, along with its adjacent land area, must possess one or more "outstandingly remarkable" values. The following is a set of guidelines used in applying the eligibility criteria.

1. **Free-flowing Values** - Free-flowing is defined in the Act as "existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway." However, the existence of small dams, diversion works, or other minor structures at the time the river segment is being considered shall not automatically disqualify it for possible addition to the Wild and Scenic Rivers System. Also, a river or stream does not have to be "floatable or boatable" to be eligible; there is no minimum "flow" requirement.

2. **Outstandingly Remarkable Values** - In addition to being "free-flowing" river segments must also possess one or more outstandingly remarkable values to be eligible for further consideration. Outstandingly remarkable values relate to scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar resources.

The term "outstandingly remarkable value" is not precisely defined in the Wild and Scenic Rivers Act. However, it should be noted that these values must be directly river-related.

Scenic - The landscape elements of landform, vegetation, water, color and related factors result in notable or exemplary visual features and/or attractions. Additional factors such as seasonal variations in vegetation, scale of cultural modifications, and length of time negative intrusions are viewed can also be considered when analyzing scenic values. Scenery and visual attractions may be highly diverse over the majority of the river or river segment; not common to other rivers in the area; and but must be of a quality to attract visitors from outside the area.

Recreational - Recreational opportunities are unique enough to attract visitors from outside of the area. Visitors would be willing to travel long distances to use the river resources for recreational purposes. River-related opportunities could include, but not be limited to, sightseeing, wildlife observation, photography, hiking, fishing, hunting, and boating.

Interpretive opportunities may be exceptional and attract visitors from outside the area. The river may provide settings for national or regional commercial usage or competitive events.

Geologic - The river or the area within the river corridor provides an example(s) of a geologic feature, process, or phenomenon that is rare, unusual, one-of-a-kind or unique to the area. The feature(s) may be in an unusually active stage of development, represent a "textbook" example and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial and other geologic structures).

Fisheries - Fishery values may be judged on the relative merits of either fish populations or habitat - or a combination of these river-related conditions.

The river is one of the top producers of resident fish species either nationally or in the area. Of particular significance is the presence of wild stocks and/or federal or state listed threatened or endangered species. Diversity of species is also important. Exceptionally high quality fish habitat will also be considered for resident species and federally-listed or candidate threatened and endangered species.

Wildlife - Wildlife values may judged on the relative merits of either wildlife populations or habitat - or a combination of these conditions. The river or area within the river corridor contains populations of resident wildlife species important in the area or nationally. Of particular significance are species considered to be unique or populations of federally listed or candidate threatened or endangered species. Diversity of species is also important.

The river or area within the river corridor provides exceptionally high quality habitat for wildlife species important in the area or nationally, or may provide unique habitat or a critical link in habitat conditions for federally listed or candidate threatened or endangered species. Adjacent habitat conditions are such that the biological needs of the species are met.

Cultural - The river or area within the river corridor contains examples of outstanding sites which have unusual characteristics relating to prehistoric use. Sites may be important in the area or nationally for interpreting prehistory; may be rare and represent an area where a culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes.

Historical - The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare, unusual, or one-of-a-kind in the area.

Note: Eligibility for inclusion in the National Register of Historic Places by itself is not sufficient justification for being considered outstandingly remarkable.

Similar Values - Other values may include significant hydrologic, paleontologic, botanic, scientific, ecologic resources as long as they are river related.

Appendix 4-2 shows the rivers and streams, containing BLM-administered public land segments, that were reviewed and the BLM eligibility determinations made.

Wild and Scenic Rivers Eligibility Screening Process

The Green River Resource Management Plan Team met on April 18, 1991, to do eligibility screening for 183 rivers, streams, creeks, etc., in the Green River Resource Area.

Because of the minimal requirements for and the broad interpretation of the "free flowing" criterion, all waterways reviewed were assumed to be free-flowing. Then, using the interdisciplinary approach, these waterways were further reviewed to determine whether or not any BLM-administered public lands along their courses contained any of the Outstandingly Remarkable Values described in the Eligibility Criteria. Of the 183 waterways reviewed, the BLM-administered lands along 140 waterways were found to not have any Outstandingly Remarkable Values and were dropped from further consideration.

The remaining 43 waterways were then discussed at some length as the team further reviewed them under the Eligibility Criteria. Upon detailed review, the public lands along 35 of these waterways were found to lack outstandingly remarkable values and were dropped from further consideration. This left a total of 8 waterways containing BLM-administered lands that meet the eligibility criteria. Two of those 8 waterways - Red Creek and Currant Creek - have other streams included under their headings, as they are closely related drainages and will be considered as a unit.

Pursuant to BLM Manual 8351 (May 19,1992), a new eligibility criterion was established after the initial application of eligibility criteria by the interdisciplinary team. This new criterion states, "if less than 40 percent of the shoreline and adjacent lands in a segment is public land managed by the BLM (public land is not predominant) it is difficult to ensure that outstandingly remarkable values can be maintained [on the public lands] in the future. Accordingly, the priority shall be segments with 40 percent or more public land." Note — In cases where the BLM has less than 40 percent jurisdiction in a waterway, should the other Federal agency(ies), or State or local government, with predominant jurisdiction (individually or collectively) over the lands along a waterway wish to plan for the management of the waterway for inclusion in the WSRS, or to conduct a joint study for that purpose, the BLM will participate in the study and will cooperate in managing the BLM-administered segments involved to be compatible with the management of the interspersed lands. Otherwise, such BLM-administered lands and their inherent resource values will be managed in accordance with the BLM land use plan (i.e., Resource Management Plan or Management Framework Plan) under which they are covered.

After considering this new criterion, the eligibility findings of only two waterways were affected (Note that a "waterway", as we have used the term, is the same thing as a "segment", in the context of the part of the BLM Manual quoted above). The Big Sandy and Green River waterways were determined to be ineligible because the BLM-administered public land parcels along these waterways represent only about 2 percent of the total administrative jurisdiction of all lands along the waterways. Prior to applying this new criterion, a 1.5-mile segment of the Big Sandy and nine public land segments (totalling 2.85 miles) of the Green River were initially determined to be eligible. After applying this new criterion, the public lands along 6 waterways remained eligible for further review under the factors of suitability for inclusion in the WSRS.

Wild and Scenic Rivers Suitability Screening Factors

All the BLM-administered public land river segments that were found eligible were classified (i.e., wild, scenic, or recreational) and then were evaluated for their suitability to be included in the WSRS. Some factors to consider in the suitability determination include, but are not limited to:

1. Characteristics which do or do not make the area a worthy addition to the national WSRS.

2. Current status of landownership and land and resource uses in the area, including the amount of private land involved and associated or conflicting uses.

3. Reasonably foreseeable potential uses of the land and related waters which would be enhanced, foreclosed, or curtailed if the area were included in the National WSRS, and the values which could be foreclosed or diminished if the area is not protected as part of the System.

4. Public, State, local, or Federal interest in designation of the river, including the extent to which the administration of the river, including the costs thereof, may be shared by State, local, or other agencies and individuals.

5. Estimated cost of acquiring necessary lands and interests in lands and of administering the area if it is added to the System.

6. Ability of the agency to manage the river area or segment as a Wild and Scenic River.

7. Historical or existing rights which would be adversely affected as to foreclose, extinguish, curtail, infringe, or constitute a taking which would entitle the owner to just compensation if the area were included in the National WSRS. In the suitability analysis, adequate consideration will be given to rights held by owners, applicants, lessees, or claimants.

8. Other issues and concerns identified in the land-use planning process.

Appendix 4-3 identifies each BLM-administered public land river segment and shows their preliminary classification. Appendix 4-4 is a summary of the suitability assessment.

Interim Management of Suitable River or Stream Segments

An interim management prescription will be developed and implemented for any river or stream segment crossing BLM-administered public lands that is determined to be suitable for inclusion in the WSRS. It is these interim management prescriptions for suitable river or stream segments that will constitute the planning decision for wild and scenic rivers in Wyoming BLM land use plans. A suitable segment would then be managed under the interim management prescription until Congress decides to further consider it for possible designation and inclusion in the WSRS.

APPENDIX 4-2

WILD AND SCENIC RIVERS ELIGIBILITY SCREENING

River/Stream (waterway) Reviewed	Free Flowing?	Outstandingly Remarkable Value	At Least 40% BLM Jurisdiction?
Alkali Creek	yes	no	
Alkali Creek[1]	yes	no	
Alkali Creek[1]	yes	no	
Alkali Draw	yes	no	
Amidon Creek	yes	no	
Antelope Creek	yes	no	
Antelope Wash	yes	no	
Basin Creek	yes	no	
Black Butte Creek	yes	no	
Black Butte Creek[1]	yes	no	
Buckboard Wash	yes	no	
Burnt Canyon Creek	yes	no	
Burnt Canyon Creek[1]	yes	no	
Beaver Creek	yes	no	
Big Dry Creek	yes	no	
Bone Draw	yes	no	
Beans Spring Creek	yes	no	
Beef Steer Creek	yes	yes, Scenic[2]	yes
Blacks Fork River	yes	no	
Big Hermit Gulch	yes	no	
Birch Creek	yes	no	
Blutcher Creek	yes	no	
Blair Creek	yes	no	
Black Rock Creek	yes	no	
Bear Creek	yes	no	
Burnt Fork	yes	no	
Browse Creek	yes	no	
Big Sandy River	yes	yes, Fishery Historic	no
Bitter Creek	yes	no	
Black Rock Creek	yes	no	
Beaver Creek	yes	no	
Castello Creek	yes	no	
Circle Creek	yes	no	
Currant Creek West Fork	yes	yes, Candidate fish species[3]	yes
Cottonwood Creek	yes	no	
Cottonwood Creek[1]	yes	no	
Cedar Creek	yes	no	
Chicken Creek	yes	no	
Clear Creek	yes	no	
Camp Creek	yes	no	
Corral Creek	yes	no	
Coyote Creek	yes	no	
Currant Creek	yes	yes, Candidate fish species[3]	yes

APPENDIX 4-2

WILD AND SCENIC RIVERS
ELIGIBILITY SCREENING (Continued)

River/Stream (waterway) Reviewed	Free Flowing?	Outstandingly Remarkable Value	At Least 40% BLM Jurisdiction?
Carlson Draw	yes	no	
Crump Creek	yes	no	
Circle Spring Draw	yes	no	
Carter Spring Creek	yes	no	
Cutthroat Draw Creek	yes	no	
Canyon Creek	yes	yes, Scenic, Historical	yes
Dans Creek	yes	no	
Dead Man Wash	yes	no	
Dead Ox Creek	yes	no	
Dry Canyon	yes	no	
Dry Creek	yes	no	
Dry Sandy River	yes	no	
Dutch Joe Creek	yes	no	
Ely Creek	yes	no	
East Draw	yes	no	
East Grass Creek	yes	no	
East Lander Creek	yes	no	
Eighteen Mile Canyon	yes	no	
Eighteen Mile Flowing Well	yes	no	
Eighteen Mile Creek	yes	no	
East Wolf Creek	yes	no	
East Salt Wells	yes	no	
East Sweetwater	yes	no	
Fish Creek	yes	no	
Fog Gulch	yes	no	
Flume Creek	yes	no	
Four Mile Gulch	yes	no	
Gap Creek	yes	no	
Gold Creek	yes	no	
Greasewood Creek	yes	no	
Granary Draw	yes	no	
Gooseberry Creek	yes	no	
Grass Creek	yes	no	
Green River	yes	yes, Scenic, Historical, Wildlife	no
Slaughterhouse Gulch	yes	no	
Harris Slough	yes	no	
Hay Creek	yes	no	
Henry's Fork River	yes	no	
Horsethief Canyon	yes	no	
Jack Creek	yes	no	
Jack Morrow Creek	yes	no	
Jonah Gulch	yes	no	
Joyce Creek	yes	no	
June Creek	yes	yes, Scenic[2]	yes
June Creek[1]	yes	no	

APPENDIX 4-2

WILD AND SCENIC RIVERS
ELIGIBILITY SCREENING (Continued)

River/Stream (waterway) Reviewed	Free Flowing?	Outstandingly Remarkable Value	At Least 40% BLM Jurisdiction?
Killpecker Creek	yes	no	
Kinney Spring Creek	yes	no	
Little Bitter Creek	yes	no	
Little Basin Creek	yes	no	
Little Beaver Creek	yes	no	
Louse Creek	yes	no	
Little Dry Creek	yes	no	
Little Dry Creek[1]	yes	no	
Little Firehole Creek	yes	no	
Little Hermit Gulch	yes	no	
Little Mitchell Slough	yes	no	
Long Draw	yes	no	
Long Draw[1]	yes	no	
Lander Creek	yes	no	
Little Sandy Creek	yes	no	
Little Sweetwater Creek	yes	no	
Lizzie Spring Creek	yes	no	
Mill Creek	yes	no	
Mill Creek[1]	yes	no	
Monument Draw	yes	no	
Middle Fork Currant Creek	yes	no	
Middle Firehole Creek	yes	no	
Mitchell Slough	yes	no	
Middle Marsh Creek	yes	no	
Monument Creek	yes	no	
North Little Sweetwater Creek	yes	no	
No Name Creek	yes	no	
North Fork of Bear Creek	yes	yes, Geologic, Scenic, Recreation, Other (Biology)	yes
Ord Creek	yes	no	
Oregon Gulch	yes	no	
Oregon Slough	yes	no	
Pacific Creek	yes	yes, Historical, Fishery	no
Pacific Butte Spring	yes	no	
Poison Creek	yes	no	
Palmer Draw	yes	no	
Pine Creek	yes	no	
Pine Creek[1]	yes	no	
Pine Creek[1]	yes	no	
Little Pine Creek	yes	no	
Pool Creek	yes	no	
Parnell Creek	yes	no	
Patrick Draw	yes	no	
Pretty Water Creek	yes	no	
Rock Cabin Creek	yes	no	

APPENDIX 4-2

WILD AND SCENIC RIVERS

ELIGIBILITY SCREENING (Continued)

River/Stream (waterway) Reviewed	Free Flowing?	Outstandingly Remarkable Value	At Least 40% BLM Jurisdiction?
Red Creek	yes	yes, Scenic[2]	yes
Red Creek[1]	yes	no	
Little Red Creek	yes	yes, Scenic[2]	yes
Sand Creek	yes	no	
Sage Creek	yes	no	
Sage Creek[1]	yes	no	
Scott Canyon	yes	no	
Sculpin Creek	yes	no	
Spring Creek	yes	no	
Spring Creek[1]	yes	no	
Spring Creek[1]	yes	no	
Spring Creek[1]	yes	no	
Spring Creek[1]	yes	no	
Side Creek	yes	no	
Station Draw	yes	no	
East Sweetwater River	yes	no	
Sweetwater Gap Ranch Fork	yes	no	
Shell Creek	yes	no	
Shute Creek	yes	no	
Skull Creek	yes	no	
Sugarloaf Marsh Creek	yes	no	
Smiley Draw	yes	no	
Sharps Meadow Creek	yes	no	
Snow Creek	yes	no	
South Fork	yes	no	
South Pack Saddle	yes	no	
Spitzi Creek	yes	no	
Squaw Creek	yes	no	
Snow Spring Creek	yes	no	
Salt Wells Creek	yes	no	
Sulphur Creek	yes	no	
East Salt Wells Creek	yes	no	
Sweetwater Creek	yes	no	
Sweetwater River	yes	yes, Historical, Scenic, Recreation	yes
Tie Creek	yes	no	
Ten Mile Draw	yes	no	
Twelve Mile Gulch	yes	no	
Three Mile Meadow	yes	no	
Tally Pit Draw	yes	no	
Trout Creek	yes	no	
Upper Marsh Creek	yes	no	
Vermillion Creek	yes	no	
North Fork Vermillion Creek	yes	no	
Washington Draw	yes	no	
White Acorn Creek	yes	no	
West Canyon Creek	yes	no	

APPENDIX 4-2

WILD AND SCENIC RIVERS

ELIGIBILITY SCREENING (Continued)

River/Stream (waterway) Reviewed	Free Flowing?	Outstandingly Remarkable Value	At Least 40% BLM Jurisdiction?
Winter Fat Creek	yes	no	
Water Hole Draw	yes	no	
West Little Creek	yes	no	
West Pacific Creek	yes	no	
Worm Creek	yes	no	
West Spring Creek	yes	no	
West Willow Creek	yes	no	

[1] There are several examples of different creeks with the same name.

[2] Beef Steer Creek, June Creek, Red Creek, and Little Creek are closely tied to the Red Creek drainage and are being considered together as one unit.

[3] Currant Creek and Currant Creek West Fork are being considered as one unit.

APPENDIX 4-3

SEGMENT IDENTIFICATION AND PRELIMINARY CLASSIFICATION

Segment No.	Length in Miles	Location	Distance to Next Segment	Notes/Description	Class Recommendation
		Little Red Creek			
1	0.5	R. 103 W., T. 12 N., Section 18, from border state land northwest to private border land.	2.0	Low riparian; two 2-tracks in corridor; one 2-track crosses creek.	S
2	1.0	R. 104 W., T. 12 N., Section 12, from border private land north to border private land, Section 1.	0.2	Low riparian; road parallels entire segment east bank and crosses creek; seismic parallels west bank and crosses creek; 1/4 mile of segment is public water reserves.	R
3	0.7	R. 104 W., T. 12 N., Section 1 from border private land northwest to border private land, R. 104 W., T. 13 N., Section 35.	End	Low riparian; private lands in corridor, road and two 2-tracks in corridor parallel both banks.	R
		June Creek			
1	2.6	R. 104 W., T. 12 N., Section 9, from border state land north to junction with Red Creek, R. 104 W., T. 13 N., Section 34.	End	Low-moderate riparian; 2-track parallels entire west bank; four 2-track crossings of creek.	R
		Beef Steer Creek			
1	4.0	R. 105 W., T. 13 N., Section 12, from headwaters southeast to junction with Red Creek, R. 104 W., T. 13 N., Section 13.	End	Low-moderate riparian; 3 seismic crossings; four 2-track access points on west side of creek.	S
		Red Creek			
1	0.8	R. 103 W., T. 12 N., Section 4, from headwaters spring, north to border state land, R. 103 W., T. 13 N., Section 34.	0.3	State lands in corridor.	
2	0.2	R. 103 W., T. 13 N., Section 34, from border state land northwest to border state land, Section 33.	3.0		
3	0.25	R. 104 W., T. 13 N., Section 36, from border state land west to border state land.	0.4	Low-moderate riparian; 2-track parallels south bank.	R
4	0.3	R. 104 W., T. 13 N., Section 35, from border private land northwest to border private land, Section 34.	0.5	Low riparian private lands in corridor; 2-track in corridor parallels creek on north 0.2 mile.	S
5	3.5	R. 104 W., T. 13 N., Section 34, from border private land west to border state land, Section 31.	0.8	Low riparian; two 2-track crossings, two 2-tracks in corridor parallel south bank 20% of segment; 1 seismic crossing.	R
6	2.6	R. 105 W., T. 12 N., Section 1, from border state land southwest to border private land Section 15.	1.0	Low riparian; no crossings; eight 2-track access points both sides of segment.	S

SEGMENT IDENTIFICATION AND PRELIMINARY CLASSIFICATION (Continued)

Segment No.	Length in Miles	Location	Distance to Next Segment	Notes/Description	Class Recommendation
		Red Creek (Continued)			
7	0.6	R. 105 W., T. 12 N., Section 22, from border private land south to Wyoming-Utah state line and private land.	End	Low riparian; road crosses creek and parallels 50% 50% of segment; ranch 3/4 mile SE of lower end of segment.	R
		Currant Creek			
1	1.2	R. 106 W., T. 13 N., Section 1, from border state land north to border state land, R. 106 W., T. 14 N., Section 36.	0.6	Moderate riparian; no roads in corridor; nearest access is 2-track parallel to creek 1/2 mile west on bench.	W
2	0.5	R. 106 W., T. 14 N., Section 36, from border state land north to border state land, Section 25.	0.8	Moderate riparian; no roads in corridor; nearest access is 2-track parallel to creek 1/2 mile west on bench.	W
3	0.8	R. 106 W., T. 14 N., Section 25, from border state land northwest to border state land, Section 24.	1.5	Moderate riparian; one 2-track parallels east bank in lower end of segment; state lands in corridor; 80% of segment is public water reserve.	S
4	2.0	R. 106 W., T. 14 N., Section 11, from border state land northwest to border private land, Section 10.	1.25	Moderate to heavy riparian; 2-track parallels 1.5 miles of creek on north side; segment includes 1/4 mile public water reserves.	S
5	0.5	R. 106 W., T. 14 N., Section 5, from border state land west to border private land. Section 31.	2.0	Moderate to heavy riparian; entire segment is public water reserve; one 2-track parallels entire creek and crosses once; another 2-track follows opposite side 50% of segment.	S
6	0.5	R. 107 W., T. 14 N., Section 1, from border private land northwest to border private land.	4.5	Heavy riparian; 1 ranch approximately 1/2 mile below segment end; 2-track parallels both sides creek; private land in corridor at each end of segment.	S
7	0.6	R. 107 W., T. 15 N., Section 30, from border private land west to border private land.	0.2	Low-moderate riparian; road parallels entire segment above north bank; one 2-track access to creek.	R
8	0.2	R. 107 W., T. 15 N., Section 30, from border private land west to border Flaming Gorge NRA.	End	Low-moderate riparian; road and 2-track parallel entire segment on northside.	R
		Currant Creek (Dripping Springs Fork)			
1	2.0	R. 105 W., T. 13 N., Section 7, from headwaters north to border state land; R. 106 W., T. 14 N., Section 36.	End	Heavy riparian; state lands in corridor; 1 powerline crossing; 2-track parallels upper half of creek; 1 mile of segment is public water reserves.	S
		Currant Creek (East Fork)			
1	1.0	R. 105 W., T. 13 N., Section 7, from headwaters north to junction with Currant Creek, R. 106 W., T. 13 N., Section 1.	End	Moderate-heavy riparian; 1 powerline crossing; one 2-track parallels west bank of creek.	S

SEGMENT IDENTIFICATION AND PRELIMINARY CLASSIFICATION (Continued)

Segment No.	Length in Miles	Location	Distance to Next Segment	Notes/Description	Class Recommendation
		Currant Creek (Middle Fork)			
1	2.0	R. 105 W., T. 13 N., Section 19, northwest to border state land, R. 106 W., T. 13 N., Section 12.	End	Moderate-heavy riparian; 1 powerline crossing; one 2-track parallels lower 50% of west bank.	S
		Currant Creek (West Fork)			
1	0.25	R. 106 W., T. 13 N., Section 14, from border state land north to border state land.	0.3	Low riparian; one 2-track parallels west bank.	R
2	0.2	R. 106 W., T. 13 N., Section 11, from border state land north to border state land.	0.25	Low riparian; no roads in corridor; nearest access road 1/2 mile west parallel segment on ridge.	W
3	0.3	R. 106 W., T. 13 N., Section 12 from border state land, north to border state land.	End	Low riparian,; one 2-track access at lower end of segment.	R
		Pacific Creek			
1	3.5	R. 101 W., T. 27 N., Section 5, from headwaters west to border private lands, R. 102 W., T. 27 N., Section 1.	2.0	0-low riparian; road/2-track along entire length of creek - right next to creek; historic trail in corridor.	R
2	4.0	R. 102 W., T. 27 N., Section 11, from border private land southwest to border private land, Section 21.	1.0	Low-moderate riparian; three 2-track crossings; dam/structure in channel; 2-tracks on both sides of creek upper half and 1 on lower half; other 2-tracks in corridor; historic trail in corridor.	R
3	0.5	R. 102 W., T. 27 N., Section 29, from border private land southwest to border private land.	0.8	Moderate-heavy riparian; two 2-tracks in corridor parallel north bank.	S
4	0.2	R. 102 W., T. 27 N., Section 31, from border private land southwest to border private land.	1.0	Low riparian; road parallels north bank in corridor.	S
5	0.2	R. 103 W., T. 26 N., Section 1, from border state land west to border state land.	0.25	Low riparian; state lands in corridor; 2 seismic crossings of creek.	S
6	0.3	R. 103 W., T. 26 N., Section 2, from border state land southwest to border state land.	0.6	Low riparian; state lands in corridor; old railroad grade access 1/2 mile north; no roads in corridor.	W
7	0.1	R. 103 W., T. 26 N., Section 2, from border state land southwest to border state land.	0.2	Low riparian; state lands in corridor; railroad grade in corridor.	S
8	0.1	R. 103 W., T. 26 N., Section 2, from border state land southwest to border state land.	1.0	Low riparian; state lands in corridor; 1 seismic crossing; railroad grade in corridor.	R
9	0.1	R. 103 W., T. 26 N., Section 10, from border state land south to border state land.	0.1	Low riparian; state lands in corridor; regrade crosses creek.	R

SEGMENT IDENTIFICATION AND PRELIMINARY CLASSIFICATION (Continued)

Segment No.	Length in Miles	Location	Distance to Next Segment	Notes/Description	Class Recommendation
		Pacific Creek (Continued)			
10	0.2	R. 103 W., T. 26 N., Section 10, from border state land southwest to border state land.	2.0	Low riparian; state lands in corridor; railroad grade in corridor; 2-track crosses creek; one other 2-track to creek.	R
11	0.1	R. 103 W., T. 26 N., Section 17, from border state land southwest to border state land.	1.0	Low riparian; state lands in corridor; railroad grade in corridor; two 2-tracks in corridor; 1 along creek.	R
12	0.1	R. 103 W., T. 26 N., Section 19, from border state land southwest to border state land.	0.3	Low riparin; state lands in corridor; one 2-track in corridor.	S
13	0.3	R. 103 W., T. 26 N., Section 19, from border state land southwest to border state land.	0.2	Low riparian; state lands in corridor; one 2-track in corridor.	R
14	0.1	R. 104 W., T. 26 N., Section 24, from border state land southwest to border state land.	1.5	Low riparian; state lands in corridor; one 2-track/ parallels north bank.	R
15	0.2	R. 104 W., T. 26 N., Section 26, from border state land west to border state land.	0.1	Low riparian; state lands in corridor; railroad grade in corridor; 3-tracks in corridor and 1 crosses creek.	R
16	12.0	R. 104 W., T 26 N., Section 26, from border state land southwest to border Bureau of Reclamation lands, R. 105 W., T. 25 N., Section 23.	End	Low riparian; railroad grade in corridor entire length of segment; railroad crosses one time, 2-tracks parallel entire segment; 2 road and three 2-track crossings of the creek.	R
		North Fork of Bear Creek			
1	12.0	R. 100 W., T. 27 N., Section 1, from head waters southeast to Junction with Bear Creek R. 98 W, T. 25 N., Section 5.	0	Very low riparian; no private or state land in corridor; 1 faint 2-track in corridor for approximately 1 mile at upper and one 2-track road crosses at lower end.	W
		Canyon Creek			
1	1.3	R. 103 W., T. 12 N., Section 22, from headwaters northeast to border private land, Section 24.	0.7	Low-moderate riparian; road and 2-track parallel 50% of segment; 3 seismic crossings; state lands in corridor upper end; private lands in corridor lower end.	R
2	0.25	R. 102 W., T. 12 N., Section 18, from border private land northeast to border private land.	0.5	Low riparian; two 2-tracks to creek from north private lands in corridor; road parallels segment south of creek within 1/4 mile.	R
3	0.2	R. 102 W., T. 12 N., Section 18, from border private land northeast to border state land.	1.0	Low riparian; 2-track parallels; creek on south side.	R

SEGMENT IDENTIFICATION AND PRELIMINARY CLASSIFICATION (Continued)

Segment No.	Length in Miles	Location	Distance to Next Segment	Notes/Description	Class Recommendation
		Canyon Creek (Continued)			
4	1.1	R. 102 W., T. 12 N., Section 17, from border state land southeast to border private land, Section 16 (SE corner).	1.0	Low-riparian; road parallels segment northside; 1 old irrigation diversion; 2 roads and 3 seismic crossings.	R
5	1.1	R. 102 W., T. 12 N., Section 23, from border private land east to border private land.	0.7	Low-moderate riparian; road parallels segment north side of creek; 1 new irrigation diversion.	R
6	0.6	R. 102 W., T. 12 N., Section 13, from border private land east to border private land, R. 101 W., T. 12 N., Section 18.	1.6	Moderate riparian; road crosses creek and parallels segment on north side of creek; private lands on north edge of corridor.	R
7	0.1	R. 101 W., T. 12 N., Section 20, from border state land southeast to border private land.	0.6	Moderate riparian; bench road parallels north side of segment 1/8 mile from creek.	R
8	0.4	R. 101 W., T. 12 N., Section 21 from border private land southeast to Wyoming-Colorado state line.	End	Moderate-heavy riparian; no roads in corridor; nearest access 2-track to creek at upper beginning of segment.	W
		Sweetwater River			
1	0.6	R. 102 W., T. 30 N., Section 19, from Bridger Forest border south to beginning Sweetwater Canyon; Section 19.	0	Heavy riparian; one road leading to Guard Station Campground and network of roads in the campground. Recreational usage.	R
2	3.0	R. 102 W., T. 30 N., Section 19 from beginning Sweetwater Canyon Campground.	0	No access to Canyon other than foot; three 2-tracks to rim of Canyon from west; road access to Sweetwater Campground at southern end of segment.	W
3	2.8	R. 102 W., T. 29 N., Section 5 from Sweetwater Campground southeast to border state lands, Section 16.	3.0	Heavy riparian; road access into segment and road parallels 0.1 mile river.	S
4	0.6	R. 102 W., T. 29 N., Section 27, from border private land SE, to border state lands.	0.5	Heavy riparian; nearest access 2-track 1/2 mile south of segment end; no roads in corridor.	W
5	0.5	R. 102 W., T. 29 N., Section 34, from border state land south to border private land.	0.25	Heavy riparian; 2-track parallels west bank; one 2-track access from east; two 2-tracks access from west.	S
6	1.0	R. 102 W., T. 28 N., Section 4, from border private land south to border private land.	0.2	Heavy riparian; no roads in corridor; nearest access is 2-track 1/4 mile above north end of segment.	W
7	1.2	R. 102 W., T. 28 N., Section 10, from border private land southeast to border private land Section 11.	3.2	Heavy riparian; no roads in corridor; nearest access is parallel road 3/4 mile east of river.	W

SEGMENT IDENTIFICATION AND PRELIMINARY CLASSIFICATION (Continued)

Segment No.	Length in Miles	Location	Distance to Next Segment	Notes/Description	Class Recommendation
		Sweetwater River (Continued)			
8	0.6	R. 101 W., T. 28 N., Section 19, from border private land southeast to border private land.	8.5	Heavy riparian; two 2-tracks in corridor; private lands in corridor.	S
9	2.5	R. 100 W., T. 28 N., Section 29, from border state land northeast to border private land Section 27.	0.3	Moderate-heavy riparian; two 2-tracks in corridor each side of river.	S
10	0.3	R. 100 W., T. 28 N., Section 29, from border state land northeast to border private land, Section 26.	End	Heavy riparian; private land in corridor; diversion and irrigation ditch along north bank of river; two 2-tracks in corridor.	R

APPENDIX 4-4

WILD AND SCENIC RIVERS SUITABILITY ASSESSMENT

River/Stream	Determination	Justification
Little Red Creek (all segments)	Unsuitable	Not a worthy addition to WSR System; Land ownership conflicts; Manageability
June Creek (all segments)	Unsuitable	Land ownership conflicts; Manageability
Beef Steer Creek (all segments)	Unsuitable	Land ownership conflicts; Manageability
Red Creek (all segments)	Unsuitable	Land ownership conflicts; Manageability
Currant Creek and Forks in Drainage (all segments)	Unsuitable	Cost of acquiring lands and interests and administration cost if acquired; Manageability
Pacific Creek (all segments)	Unsuitable	Land ownership conflicts; Manageability
North Fork of Bear Creek (all segments)	Unsuitable	Not a worthy addition to WSR System; Lack of interest for designation
Canyon Creek (all segments)	Unsuitable	Potential use conflicts; Manageability
Sweetwater River Segments 1 - 7	Suitable	
Sweetwater River Segments 8 - 10	Unsuitable	Land ownership conflicts

APPENDIX 5-1

BEST MANAGEMENT PRACTICES FOR PREFERRED ALTERNATIVE, ALTERNATIVE B, AND ALTERNATIVE C

Any produced water pit or drilling fluids pit that shows indications of containing hazardous wastes will be tested for the Toxicity Characteristic Leaching Procedure (TCLP) constituents. If analysis proves positive, the fluids will be disposed of in an approve manner. The cost of the testing and disposal will be borne by the potentially responsible party.

Vegetative buffer strips of at least 100 feet should be left intact next to a perennial stream during controlled burning.

The inner gorge of intermittent and ephemeral drainages should be burned in such a manner as to leave unburned patches of vegetation. At no time should the burn consume more than 50 percent of the cover within the inner gorge area. The use of herbicides for vegetative manipulation should proceed with great care when done in the proximity of willows, cottonwoods, or aspens so as not to damage such stands unless the prescription actually calls for such removal.

Floatable stream stretches should be managed so that there is no more than a 10 percent increase in fecal coliform count.

Vegetative buffer strips should be maintained between developed recreational facilities and live water.

Prior to installing toilet facilities associated with recreation, ground water protection should be provided for.

Installation of instream structures for fisheries, watershed, or irrigation enhancement must be completely engineered if the high flow for the stream exceeds 10 CFS.

Herbicide loading sites will be located at least 500 feet from live water or riparian areas or wetlands.

Watershed BMPs

Dumping of produced water on roads will not be allowed unless they contain less than 400 mg/l TDS and do not contain hazardous waste.

Main artery roads regardless of primary user will be crowned, ditched, drained, and surfaced with gravel to reduce sediment, salt, and phosphate loading to the Green River.

Reserve pits will not be located in areas where groundwater is less than 50 feet from the surface and soil permeability is less than 0.06 inches/hour.

In areas where soil permeability is less than 0.06 inches/hour and where shallow ground water exists (50 feet or less), produced water from oil and gas operations will be disposed of in an approved aboveground storage tanks or by other acceptable means complying with Onshore Order #7.

Soils Management Common to All Alternatives

In support of the Bureau's mission, the Soils program is committed to sustaining and enhancing the health and productivity of soils. Soil capability and potential must be reflected in environmentally sound resource management.

If clay soils are used as pit lining they should have a liquid limit greater than 30 and a Plasticity Index of at least 20. Assuming that bentonite in drilling fluids will sufficiently seal a pit is not good procedure.

Current objectives focus on soil conservation planning for surface disturbance actions. Soil conservation should be addressed during the initial phase of any soil disturbing action, thereby, maintaining soil productivity and stability levels through the use of existing guidelines and techniques. Some areas may require more thorough soil management practices than others, however, this is dependent on the type and duration of the action and the effect on site-specific soil characteristics.

Some examples of standards applied throughout the resource area based on soil management criteria are:

1. Closures due to saturated soil conditions when soil resource damage would occur due to wheel rutting or compaction on wet soils.
2. Salvage and subsequent replacement of topsoil whenever possible on surface disturbing activities.

3. Limiting disturbance on slopes greater than 25 percent.

Emphasis should continue to be placed on the reduction of soil erosion and sediment into the Green River basin water system. Of particular importance would be those areas with saline soils such as the Little Colorado Desert or those areas with highly erodible geology and soils such as Red Creek drainage.

Management

Management of the soil resource would continue to be based upon the following: 1) Evaluation and interpretation of soils in relation to project design and development; 2) Identification and inventory of soils for baseline data; 3) Identification and implementation of methods to reduce accelerated erosion; and 4) Provide soil data in support of monitoring and inventory.

1. Evaluation and interpretation involves identification of soil properties which would influence their use and recommendations for development while minimizing soil loss. Projects would be examined on a site-specific basis, evaluating the potential for soil loss and the compatibility of soil properties with project design. Stipulations and mitigating measures are provided on a case-by-case basis to insure soil conservation and practical management. Projects requiring soil interpretations include: construction of linear right-of-way facilities (i.e., pipelines, roads, railroads, and power transmission lines); construction of water impoundments; rangeland manipulation through fire or mechanical treatments; construction of plant site facilities, pump stations, well pads and associated disturbances; and reclamation projects.

2. The current Order 3 soil survey is designed to update general soils information and provide data to those areas lacking soil inventories. A baseline soil inventory is ongoing to provide information on productivity, soil engineering properties, and soil erosion potentials. Proposed "I" category allotments and areas impacted by Oil and Gas projects receive priority in the soil survey process.

3. Identification of critical erosion condition areas would continue during soil surveys, monitoring, and AMP development for the purpose of avoidance and special management.

4. Soil moisture and temperature baseline data would be gathered to provide information on growing season length and effective precipitation. Use of soil moisture and temperature data would include development of soil survey temperature and moisture regimes.

Before a surface disturbing activity is authorized, topsoil depth will be determined. The amount of topsoil to be removed, along with topsoil placement areas, will be specified in the authorization. The uniform distribution of topsoil over the area to be reclaimed will be required, unless conditions warrant a varying depth. On large surface-disturbing projects (e.g., gas processing plants) topsoil will be stockpiled and seeded to reduce erosion. Where feasible, topsoil stockpiles will be required to be designed to maximize surface area to reduce impacts to soil microorganisms. It is recommended that stockpiles be no more than 3 to 4 feet high. Areas used for spoil storage will be required to be stripped of topsoil before spoil placement. The replacement of topsoil after spoil removal will be required.

Temporary disturbances which do not require major excavation (e.g., small pipelines and communication lines) may be stripped of vegetation to ground level using mechanical treatment, leaving topsoil intact and root mass relatively undisturbed.

Air Quality Protection Measures

As projects are planned that include possible major sources of air pollutant emissions, special air quality protection related stipulations are added to BLM permits and rights-of-way grants. In addition, the BLM coordinates with the Wyoming Department of Environmental Quality/Air Quality Division during the process of analysis. This coordination often results in the technical review of applications for permits and(or) identification of additional stipulations to be applied to these permits.

The release of hazardous air contaminants, particularly the emissions from sour natural gas sweetening plants (a process used to remove H_2S from natural gas resulting in the emission of sulfur dioxide), is a public concern. BLM requires industry to prepare analyses of risks involved with the development of sour gas pipelines and treatment facilities. These analyses are designed to project impacts both to the public and to resource values. To aid in achieving these goals, BLM will consult with the State of Wyoming, the U.S. Forest Service, industry, and the public to ensure that the most technically sound, environmentally balanced, and economically feasible decisions are made.

Reclamation

BLM reclamation goals emphasize: 1) protection of existing vegetation; 2) minimal disturbance of existing environment; 3) stabilization through establishment of ground cover; 4) establishment of vegetation consistent with land use planning.

All reclamation is expected to be accomplished as soon as possible (3 to 5 years) after the disturbance occurs with efforts continuing until a satisfactory revegetation cover is established and the site is stabilized. Before disturbance, the BLM should determine topsoil depth on proposed projects. This depth along with topsoil placement is to be specified in stipulations. Where possible, topsoil would be piled in a linear fashion, mulched as necessary, and seeded to reduce wind and water erosion and soil micro-organisms depletion. Stockpiles remaining less than two years are best for soil micro-organism survival and native seed viability. Areas used for spoil storage shall have the topsoil stripped before spoil placement and returned after spoil removal. All topsoil would be distributed uniformly over area to be reclaimed unless conditions indicate varying depth.

Only areas needed for construction would be allowed to be disturbed. Reclamation (by the lessee or grant holder) will be initiated as soon as possible after a disturbance occurs. Continued efforts will be required until satisfactory vegetation cover is established and the site is stabilized.

On all areas to be reclaimed, seed mixtures will be required to be site-specific and will be required to include species promoting soil stability. Livestock palatability and wildlife habitat needs will be given consideration in seed mix formulation. Interseeding, secondary seeding, or staggered seeding may be required to accomplish revegetation objectives. During rehabilitation of areas in important wildlife habitat, provision will be made for the establishment of native browse and forb species, if determined to be beneficial for the habitat affected.

Follow-up seeding or corrective erosion control measures may be required on areas of surface disturbance which experience reclamation failure.

Trees, shrubs, and ground cover (not to be cleared from rights-of-way) will require protection from construction damage. Backfilling to preconstruction condition (in a similar sequence and density) will be required. The restoration of normal surface drainage will also be required.

Any mulch used will be free from mold, fungi, or noxious weed seeds. Mulch may include native hay, small grain straw, wood fiber, live mulch, cotton, jute, synthetic netting, and rock. Straw mulch should contain fibers long enough to facilitate crimping and provide the greatest cover.

The grantee or lessee will be responsible for the control of all noxious weed infestations on surface disturbances. Control measures will adhere to those allowed in the Rock Springs District Noxious Weed Control EA (USDI 1982a) or the Regional Northwest Area Noxious Weed Control Program EIS (USDI 1987).

Well Pads and Plant Facilities

It is recommended that all reserve pits be lined unless soil permeability is less than 0.06 in/hr. Abandoned sites must be satisfactorily rehabilitated as determined by the BLM. Soil samples may be processed to determine reclamation potential, appropriate reseeding species, and nutrient deficits. Tests may include: Ph, mechanical analysis, salt content, ESP, and nitrogen, phosphorous, and potassium. Areas not used for production purposes should be backfilled and blended into the surrounding terrain, reseeded, and erosion control measures installed. Terraces or elongated water breaks would be constructed after slope reduction. Disturbances should be reclaimed or managed for zero runoff from the location until the area is stabilized. All excavations and pits should be closed by backfilling and contouring to conform to surrounding terrain.

Abandoned sites must be satisfactorily rehabilitated by the lessee in accordance with a plan approved by BLM. On well pads and larger locations, the surface use plan will include objectives for successful reclamation including: soil stabilization, plant community composition, and desired vegetation density and diversity. No surface disturbance is recommended on slopes in excess of 25 percent unless erosion controls can be ensured and adequate revegetation is expected. Engineering proposals and revegetation and restoration plans will be required in these areas.

On producing locations, operators will be required to reduce slopes to original contours (not to exceed 3:1 slopes). Erosion control measures will be required after slope reduction. Facilities will be required to approach zero runoff from the location to avoid contamination and water quality degradation downstream. All unused portions of facilities or producing well locations will be resurfaced with topsoil and seeded with soil stabilizing species. Mulching, erosion control measures, and fertilization may be required to achieve acceptable stabilization.

Snow fences, placed to increase snowfall accumulation over a reclaimed area, and reshaping to create shallow depressions (to catch surface runoff) may be required in areas receiving 10 inches or less of annual precipitation.

No sour gas lines would be located closer than one mile to a populated area or sensitive receptor. The applicants must use the best available engineering design (e.g., alignment, block valve type and spacing, pipe grade), and best construction techniques (e.g., surveillance, warning signs) as approved by the Authorized Officer to minimize both the probability of rupture and radius of exposure in the event of an accidental pipeline release of sour gas. A variance from the one-mile distance may be granted by the Authorized Officer based on detailed site-specific analysis that would consider meteorology, topography, and special pipeline design and(or) construction measures. This analysis would ensure that populated areas and sensitive receptors would not be exposed to an increased level of risk.

Pipelines and Communication Lines

On ditches exceeding 36 inches, 6-10 inches of surface soil should be salvaged where possible on the entire right-of-way. When pipelines and communication lines are buried, there should be at least 30 inches of backfill on top of the pipe. Backfill should not extend above the original ground level after the fill has settled. Guides for construction and water bar placement are found in “Surface Operating Standards for Oil and Gas Exploration and Development” (USDI 1978). Bladed surface materials would be respread upon the cleared route once construction is completed. Disturbed areas that have been reclaimed may need to be fenced when the route is near livestock watering areas.

Existing crowned and ditched roads will be used for access where possible to minimize surface disturbances. Where possible, clearing of pipeline and communication line rights-of-way will be accomplished with the least degree of disturbance to topsoil. Where topsoil removal is necessary, it will be stockpiled (wind-rowed) and respread over the disturbance after construction and backfilling are completed. Vegetation removed from the right-of-way will also be required to be respread to provide protection, nutrient recycling, and a natural seed source.

To promote soil stability, the compaction of backfill over the trench will be required (not to extend above the original ground level after the fill has settled). Water bars, mulching, and terracing will be required, as needed, to minimize erosion. Instream protection structures (e.g., drop structures) may be required in drainages crossed by a pipeline to prevent erosion. The fencing of linear disturbances near livestock watering areas may be required.

Hazards and Waste Management

Pits should be lined unless situated in an impermeable soil. Mineral oil base drilling muds should be encouraged instead of oil base muds because of the elimination of benzene and the reduction of other hazardous chemicals.

Supplemental Mitigation Measures Specific to Fire

Guidelines for buffer areas (an area in which fire cannot spread) have been prepared to protect developed facilities and areas of highly erodible soils from the impacts of fire.

If the development is located in a grass community, a 15-foot buffer is recommended.

If the development is located in a sagebrush community, a 25-foot buffer is recommended.

In a juniper/tall brush community (serviceberry, aspen, cottonwood, willow), a 50-foot buffer is recommended.

In a conifer community (lodgepole, spruce fir), a buffer area of 25 feet plus the height of the surrounding trees is recommended.

The emissions which may be created directly by BLM activities are mitigated by applying best management practices. For example, prescribed fires are conducted to reduce emissions by burning only at appropriate fuel moistures and windspeeds (among other factors) which reduce as much as possible the smoke created. All BLM activities that may potentially cause undesirable air quality impacts are also coordinated with the Wyoming Department of Environmental Quality, Air Quality Division (WDEQ,ADQ). Permits to conduct these activities are secured (where necessary) before the activity begins, to insure compliance with all Federal, state, and local air quality laws.

APPENDIX 5-2

WYOMING AIR QUALITY REGULATIONS ON FUGITIVE DUST SUPPRESSION

Wyoming Air Quality Standards and Regulations, 1989, Section 14

Control of Particulate Emissions

(f) The emission of fugitive dust shall be limited by all persons handling, transporting, or storing any material to prevent unnecessary amounts of particulate matter from becoming airborne to the extent that ambient air standards described in these regulations are exceeded. Control measures described as follows or any equivalent method shall be considered appropriate for such control:

> (i) Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings, or structures, construction operations, the grading of roads or the clearing of land;
>
> (ii) Application of asphalt, oil, water, or suitable chemicals on dirt roads, materials stockpiles, and other surfaces which can give rise to airborne dusts;
>
> (iii) Installation and use of hood, fans and fabric filters to enclose and vent the handling of dusty materials; adequate containment methods shall be employed during sandblasting or other similar operations;
>
> (iv) Covering, at all times when in motion, open bodied trucks, transporting materials likely to give rise to airborne dust;
>
> (v) Conduct of agricultural practices such as tilling of land, application of fertilizers, etc. in such a manner as to prevent dust from becoming airborne;
>
> (vi) The paving of roadways and their maintenance in a clear condition;
>
> (vii) The prompt removal of earth or other material from paved streets onto which earth or other material has been transported by trucking or earth moving equipment, erosion by water, or other means.

APPENDIX 5-3

EROSION CONTROL, REVEGETATION, AND RESTORATION PLAN (ERRP)

The purpose of developing an ERRP is to allow for cooperative innovation in reclamation of a disturbed area to a predetermined land use for wellfield and treatment plant activities. The following is an outline of topics to be covered in an ERRP. All ERRPs must address these points but they are not limited to them. Although the ERRP is a formal document, amendments can be approved by the Authorizing Officer.

I. INTRODUCTION

Clear Identification of Reclamation Goal

This is to be identified by the Federal Land Management (FLM) agency concerned and should include specific goals for percent perennial cover and species diversity expected for successful reclamation. Predisturbance cover would be used as a guideline for establishing goals.

Short description of activity causing disturbance and project time frames.

- Proposed Start Date
- Duration of Project
- Completion Date
- End of Project Life (Estimate)

Set time frames for ERRP

- Seasonal reviews to initiate change.
- When plan will be considered implemented.

II. OBLIGATION

Exactly who (individual name, address, phone) is responsible for what in the:

- Design of Plan
- Execution of Plan
- Monitoring of Progress

An experienced and trained professional (i.e., soil scientist, reclamation specialist) that has been approved by the Authorized Officer (AO) is required to prepare and lead the implementation and monitoring of this plan.

III. SITE MAP FOR PROJECT SHOULD INCLUDE

This information should not just cover the proposed disturbed area, but should extend beyond site boundaries by approximately 150 yards.

Soil Description and Boundaries Symbols

- Soil Outcrop
- Photo Record Point
- Springs and Wet Spots

Location and Volume of Proposed Material Stockpiles

- Time Material Will Be Stored
- Type of Material in Pile

Identify Existing Drainage Patterns

Identify Existing Vegetative Cover

Identify Existing ORV or Two-Track Roads

IV. ZERO RUNOFF

Zero runoff for purposes of the ERRP means: No portion of natural or man-caused liquid will leave the disturbed area by either surface or sub-surface flow.

All disturbed sites, except linear rights-of-way, will maintain zero runoff until the area is stabilized. Stabilization will be a value that must be clearly defined in the plan.

Stabilization for purposes of the ERRP is to mean: That point in time when neither erosion nor deposition occurs which is greater than pre-disturbance. This point must be measurable (site monitoring) and self-sustaining, i.e, not dependent on site maintenance.

The AO can approve a variance from zero runoff based on detailed site specific analysis that would consider meteorology, topography, water quality, and special site design and/or construction measures.

V. EROSION CONTROL MEASURES

Description of Proposed Measures

Identify levels of runoff planned for, i.e.: 50 year storm, etc. Include capacity of all retention structures and engineering design.

Map locating erosion control measures placement

Include Zero Runoff Measures.

VI. FUGITIVE DUST CONTROL

Watering or other approve dust abatement procedures will be done to prevent severe wind erosion and loss of soil materials during construction.

Describe

How and When

VII. REVEGETATION

Type

Seed
Established Stock

Site Preparation

Planting

Planting Time Frames
Planting Method and Equipment

Fertilization Program

Rationale for Fertilizing or Not Fertilizing

VIII. MONITORING SITE RECLAMATION PROGRESS

Methods

Time Frames

Photo Record Station (with location) of Site Predisturbance

IX. SITE ABANDONMENT

Include Time Frames

X. POTENTIAL PROBLEMS

Address Possible Weak Points

- Erosion
- Slumping
- ORV Use (i.e., cover points that might conflict over ERRP implementation with area land use goals)
- Snow (management)
- Company Fire Policy (weed control) Vs. Vegetation Management Goals

APPENDIX 5-4

GENERAL SOILS MAP LEGEND

1 **Battlespring, Farson, Fraddle, Tresano, Pepal, Huguston soils**

Deep and moderately deep, well drained soils formed in sandy and gravelly alluvium on nearly level or gently sloping broad valley filling alluvial fans and upland plains or pediments. These soils are on stable landscapes and are often well developed. Elevation: 6,500 to 7,000 feet. Precipitation: 7 to 9 inches.

2 **Grieves, Almy, Goslin, Tisworth, Brownsto, Ryan Park, Forelle, McFadden, Castello, Fiveoh soils**

Deep, well drained alluvial soils formed on sloping alluvial fans and mountain toeslopes. This unit occurs along secondary streams. Elevation: 6,500 to 7,500 feet. Precipitation: 10 to 14 inches.

3 **Chrisman, Shellcreek, Dinco, Dines, Corlett, Kandaly soils**

Deep, moderately well drained soils formed in fine textured, saline and/or alkaline alluvial or lacustrine sediments on nearly level basins and fans. Included in this unit are playas and intermittent centripetally drained basins. Elevation: 6,500 to 7,000 feet. Precipitation: 6 to 9 inches.

4 **Millpot, Stunner, McCort, Starley, Cheadle, Scout, Uinta soils**

Deep, well drained gravelly sandy loam and sandy loam soils formed in Bishop Conglomerate on nearly level to sloping tablelands and mountain tops. Elevation: 7,500 to 9,500 feet. Precipitation: 12 to 19 inches.

5 **Roxal, Pishkun, Feltonia, Amsden, Libeg, Leavitt, Teeler, Teemat soils**

Shallow to deep, well drained soils formed on steep mountain slopes. This unit is subject to landslides. Elevation: 7,500 to 9,000 feet. Precipitation: 12 to 19 inches.

6 **Cambarge, Pepal, Huguston, Leckman soils**

Deep, well drained, gravelly sandy loam and fine sandy loam soils formed on nearly level or sloping stream terraces and alluvial fans. Elevation: 6,200 to 6,500 feet. Precipitation: 7 to 9 inches.

7 **Teagulf, Huguston, Haterton, Wint, Tasselman, Seedskadee, Leckman, Kandaly soils**

Moderately deep to very shallow, well drained soils formed on rolling upland plains dissected by rock ravines, short escarpments, and draws. Elevation: 6,100 to 6,700 feet. Precipitation: 7 to 9 inches.

8 **Kandaly, Teagulf, Huguston, Tasselman, Leckman, Pepal soils**

Deep sand dunes intermingled with moderately deep and shallow, well drained soils formed on rolling upland plains. Elevation: 6,100 to 7,000 feet. Precipitation: 7 to 9 inches.

9 **Kandaly, Westvaco, Haterton, Teagulf, Huguston soils**

Deep sand dunes intermingled with moderately deep to very shallow, well drained, strongly alkaline soils formed on rolling upland plains and fans. Included in this unit are some areas of badlands. Elevation: 6,300 to 7,000 feet. Precipitation: 7 to 9 inches.

10 **Cotopaxi soils**

Deep, excessively drained shifting sand dunes and sandy soils formed on undulating eolian sand deposits. Elevation: 6,400 to 7,000 feet. Precipitation: 7 to 9 inches.

11 **Huguston, Wint, Haterton, Spool, LaMarsh soils**

Rock outcrop and shallow, well drained soils formed on steep ridges, escarpments, and mountain slopes. Included in this unit are some areas of badlands. Elevation: 6,000 to 8,000 feet. Precipitation: 8 to 14 inches.

12 **Blackhall, Rentsac, Carmody, Grieves, Rencot, Thermopolis, Elk Mountain, Blazon, Delphill, Redwash, Redcreek, Shinbara soils**

Shallow and moderately deep, well drained soils formed on sloping upland plains with deep, steep-sided ravines. Elevation: 7,000 to 7,500 feet. Precipitation: 10 to 14 inches.

13 Dines, Quealman, Chrisman

Deep, poorly to well drained soils formed on nearly level or sloping floodplains, bottomlands, and alluvial fans. Some soils in this unit are strongly saline and/or alkaline. Elevation: 6,000 to 6,600 feet. Precipitation: 7 to 9 inches.

14 Typic Torriorthents, Typic Natragids, Typic Torrifluvents, Typic Calciorthids soils

Shallow to deep, well to excessively drained sandy and loamy soils formed on nearly level to steep uplands. Some soils in this unit are strongly alkaline. Elevation: 6,000 to 7,000 feet. Precipitation: 7 to 9 inches.

15 Ustic Torriorthents, Ustic Torrifluvents, Borrolic Haplargids

Shallow to deep, well to excessively drained sandy and loamy soils formed on nearly level to steep uplands. Elevation: 7,000 to 7,500 feet. Precipitation: 10 to 14 inches.

16 Typic Cryorthents, Argic Cryoborolls soils

Shallow to deep, well to excessively drained soils formed on rolling to steep foothills of the Wind River Range. Elevation: 7,200 to 8,000 feet. Precipitation: 10 to 14 inches.

17 Argic Cryoborolls, Typic Cryaquolls, Ustic Torrifluvents, Borollic Natragids soils

Shallow to deep, excessively to poorly drained sandy and loamy soils formed on nearly level to sloping terraces and floodplains. Some soils in this unit are strongly alkaline. Elevation: 6,800 to 7,500 feet. Precipitation: 10 to 14 inches.

18 Typic Cryoboralfs, Argic Cryoborolls, Agric Pachic Cryoborolls soils

Very shallow to deep, well drained sandy soils formed in granitic glacial outwash on steep mountain slopes and foothills. Elevation: 8,000 to 10,000 feet. Precipitation: 12 to 16 inches.

19 Typic Cryoborolls, Argic Cryoborolls, Argic Pachic Cryoborolls soils

Shallow to deep, well drained sandy and loamy soils formed in granitic glacial outwash on mountains slopes, foothills, terraces, and moraines. Elevation: 7,500 to 8,500 feet. Precipitation: 12 to 14 inches.

20 Havre, Forelle, Absher soils

Deep, well drained loamy soils formed on nearly level to sloping floodplains, fans, and valley fill. Elevation: 7,500 to 8,500 feet. Precipitation: 12 to 14 inches.

21 Countryman, Tisworth, Iceslew, Absher soils

Deep, well and somewhat poorly drained sandy and loamy soils formed on sloping floodplains. Elevation: 6,500 to 8,000 feet. Precipitation: 10 to 14 inches.

22 Gelkie, Hoodle, Uhl soils

Deep, well drained sandy, loamy, and gravelly soils formed on rolling plains, terraces, fans, and areas of valley fill. Elevation: 7,000 to 8,500 feet. Precipitation: 10 to 14 inches.

23 Conpeak, Cryluha soils

Shallow to moderately deep, well drained sandy and gravelly soils formed on sloping to steep hills, ridges, escarpments, fans, and pediments. Elevation: 7,000 to 8,500 feet. Precipitation: 10 to 14 inches.

24 Canburn, Turson, Dobrow, Gas Creek, Menbar, Fox Creek, Furniss, Heinsaw, Lachapella, Henrysfork, Newfork, Outlet, Redlodge, Tepete, Venapass soils

Deep, well to poorly drained, soils formed on nearly level floodplains, fans, and bottomlands. Elevation: 7,200 to 8,500 feet. Precipitation: 12 to 18 inches.

25 Dahlquist, Attewan, Brownsto, Bosler, Millburne, Abarca, Brusett, Evanston, Grimm, Poposhia, Redrob, Sinkson soils

Deep, well drained cobbly and gravelly soils formed on nearly level or sloping benches and terraces. Elevation: 6,700 to 7,200 feet. Precipitation: 10 to 14 inches.

26 Haterton, Terada, Huguston, Youjay, Garsid, Kandaly, Monte, Cambarge, Langspring, Teagulf soils

Shallow to deep, well drained soils formed on undulating or hilly formed on uplands. This unit includes some badlands. Elevation: 6,300 to 7,000 feet. Precipitation: 7 to 9 inches.

27 Hickey, Luhon, Evanston, Blazon, Brownsto, McFadden, Poposhia soils

Shallow to deep, well drained soils formed on undulating or hilly glacial moraines, old landslide areas, and footslopes. Elevation: 7,500 to 8,500 feet. Precipitation: 10 to 14 inches.

APPENDIX 5-5

SOILS

Unstable soils are those soils or soil groups (see map units) susceptible to landslides or slumping activity and which may be a hazard to permanent structures. These soils are generally found on mountain slopes and usually have a hummocky landscape as evidence of past mass movement.

Sandy soils (i.e., soils coarser than sandy loams such as loamy fine sands, loamy sands, and sands) are very susceptible to wind erosion when the protective vegetative cover has been removed. These soils are found on vegetated and stabilized dunes, uplands, and on intermittent stabilized dunes on alluvial fans. Active sand dunes are not included in this category.

Erosive soils are grouped in this category as a result of their depth, texture, and/or position on the landscape. Many of these soils are shallow (less than 20 inches to bedrock), have low water-holding capacity, and have high runoff potential. These soils are less able to withstand the erosiveness of running water compared to more developed or stable soils. The susceptibility of a particular soil to erode at a rate greater than new soil can be formed would make it highly erosive. Soils with severe erosion susceptibility present particular management problems. This does not mean that the listed soils will always erode rapidly or that those not listed will not erode. It does suggest that those soils identified as highly erodible have a history and a tendency to erode.

The following soil map units with component soils are listed for the above categories.

Unstable Soils

591 Luhon-McFadden, 10-30% slopes
705 Slider-Pishkun-Adel, 15-50% slopes
710 Slider-Rock Outcrop, 30-100% slopes

Sandy Soils

20 and 479 Cotopaxi, 1-20% slopes
68 Kandaly, 1-10% slopes
113B Kandaly-Rock Outcrop, 3-10% slopes
141 Stabilized Dunes
142 Dunes and Stabilized Dunes
143 Stabilized Dunes and Residual Uplands
169 Screggs-Littsan-Shaul, 3-20% slopes
420 Dunkle-Battlespring, 1-4% slopes
426 Battlespring-Dunkle, 3-10% slopes
427 Battlespring, 1-10% slopes
443 Dunkle, 1-4% slopes
463 Kandaly-Horsley-Westvaco, 1-6% slopes
468 Kandaly-Huguston-Texasgulf, 4-15% slopes
475 Thayer-Kandaly, 1-6% slopes
478 Otterson, 1-8% slopes
540 Zeomong, 1-20% slopes
836 Screggs, 2-8% slopes

Erosive Soils

15 Typic Camborthids, 3-25% slopes
16 Typic Haplargids, 3-30% slopes
17 Typic Camborthids, 3-30% slopes
33 Typic Camborthids, 2-18% slopes
35 Typic Camborthids, 2-25% slopes
233 Typic Torriorthents, 30-70% slopes
464 Boltus-Horsley, 8-30% slopes
485 Jansley-Horsley-Haterton, alkaline, 8-30% slopes
487 Huguston-Rock Outcrop, 8-25% slopes
502 Goslin Complex, 3-10% slopes
503 Almy Complex, 3-10% slopes
506 Redwash-Spool-Rock Outcrop, 30-50% slopes
507 Tisworth-Goslin, 3-10% slopes
518 Thermopolis-Sinkson, 3-25% slopes
526 Thermopolis-Rock Outcrop, 6-40% slopes
557 Shinbara, 30-50% slopes
563 Blazon-Shinbara-Rentsac, 30-60% slopes
707 Libeg-Ansden Variant-Teeman, 15-50% slopes
709 Southace-Teeman-Teeler, 10-60% slopes
759 Roxal-Rock Outcrop, 30-70% slopes
818 Firehole-Jansley-Rock Outcrop, 20-60% slopes
834 Jansley, 30-70% slopes
R4 Rock Outcrop-Redwash, 10-100% slopes

APPENDIX 6-1

SECTION 106 COMPLIANCE PROCESS

Figure 16 depicts the narrative of the cultural resources process.

1. The BLM may require a cultural survey of a proposed project area. The survey is conducted by either BLM personnel or an outside contractor. A survey report is produced and copies provided to BLM and the State Historic Preservation Officer (SHPO). The BLM uses the report as a basis for Natural Register evaluations of sites located, determining the effect of the project on any significant resources, and the need to mitigate any impacts to significant resources.

2. The BLM specialist or cultural resource consultant plans the survey project, conducts background research on the project area, reviews regional overviews and other documents for pertinent previous research and terrain and field conditions in the project area. Before beginning fieldwork, the consultant conducts a site file search at the SHPO records office, and if necessary, at the local BLM office.

2A. If the file search reveals that the project area has been adequately surveyed, or if the project area is one of demonstrably low site potential, a resurvey may not be warranted. The responsibility for determining the need for a survey rests with the BLM in consultation with the SHPO.

2B. The results of the file search are documented in a report that should contain a complete bibliographic reference of the previous surveys and summary of previous sites located.

3. The BLM or consultant conducts the field survey of the project area. If standard inventory requirements would not apply, the overall methodology, including survey intensity and area of study, would be determined by the BLM in consultation with the SHPO.

3A. If no sites are discovered during the survey, and if no previously recorded sites are located in the survey area, the negative results of the survey are documented in a Class III report. Cultural resource clearance is granted and the project proceeds, subject to other resource considerations, as applicable.

3B. If sites are discovered during the survey, or if previously recorded sites are located in the survey area, Steps 4 through 9 are followed.

4. Each site located is recorded on an Intermountain Antiquities Computer System (IMACS) site form.

5. Each new site and each previously recorded site is evaluated for National Register eligibility. Limited testing should be conducted as necessary.

6. and 6A. If a site is determined, in consultation between the BLM and SHPO, to be not eligible for the National Register, no further work (i.e. testing, monitoring, excavation or avoidance) is usually required.

7. and 7A. If a site is evaluated as eligible for the National Register, the reasons for its eligibility must be documented, with a detailed description of how the site meets the Criteria of Eligibility (36 CFR 60.4). If a site is eligible because of its research potential or information content (36 CFR 60.4(d)) the report must document and discuss the site information content in terms of pertinent research questions which may be addressed.

8. The effect of the project on each eligible site is evaluated and documented. "Effect" is determined by applying the criteria in 36 CFR 800.3.

8A1. If there will be no effect, no further work at the site is warranted.

8A2. This is documented in the Class III report (see Step 9).

8B1. If the impacts to the site will result in adverse effects, this is also documented in the Class III report (see Step 9).

8B2. Recommendations to mitigate adverse effects should be directed at reducing or eliminating impacts to those qualities which make the site eligible for the National Register. Avoidance or in situ preservation are the preferred options. Data recovery is appropriate if avoidance or in situ preservation are not feasible or cost effective. Monitoring of construction may also be used under certain conditions.

9. A report is prepared documenting the results of Steps 1 through 8A2 and/or 8B2 and copies of the report submitted to the BLM, the SHPO, and the applicant/land user.

10. The BLM, in consultation with the SHPO, and the Advisory Council on Historic Preservation use the information provided in Step 9 to carry the "106" review process to completion.

11. After the above process is completed, the proposed land use may be permitted with appropriate resource stipulations.

The BLM also manages cultural resources pursuant to mandates in Section 110 of the National Historic Preservation Act and sites that are not significant within the Section 106 context may still be managed for certain purposes under Section 110.

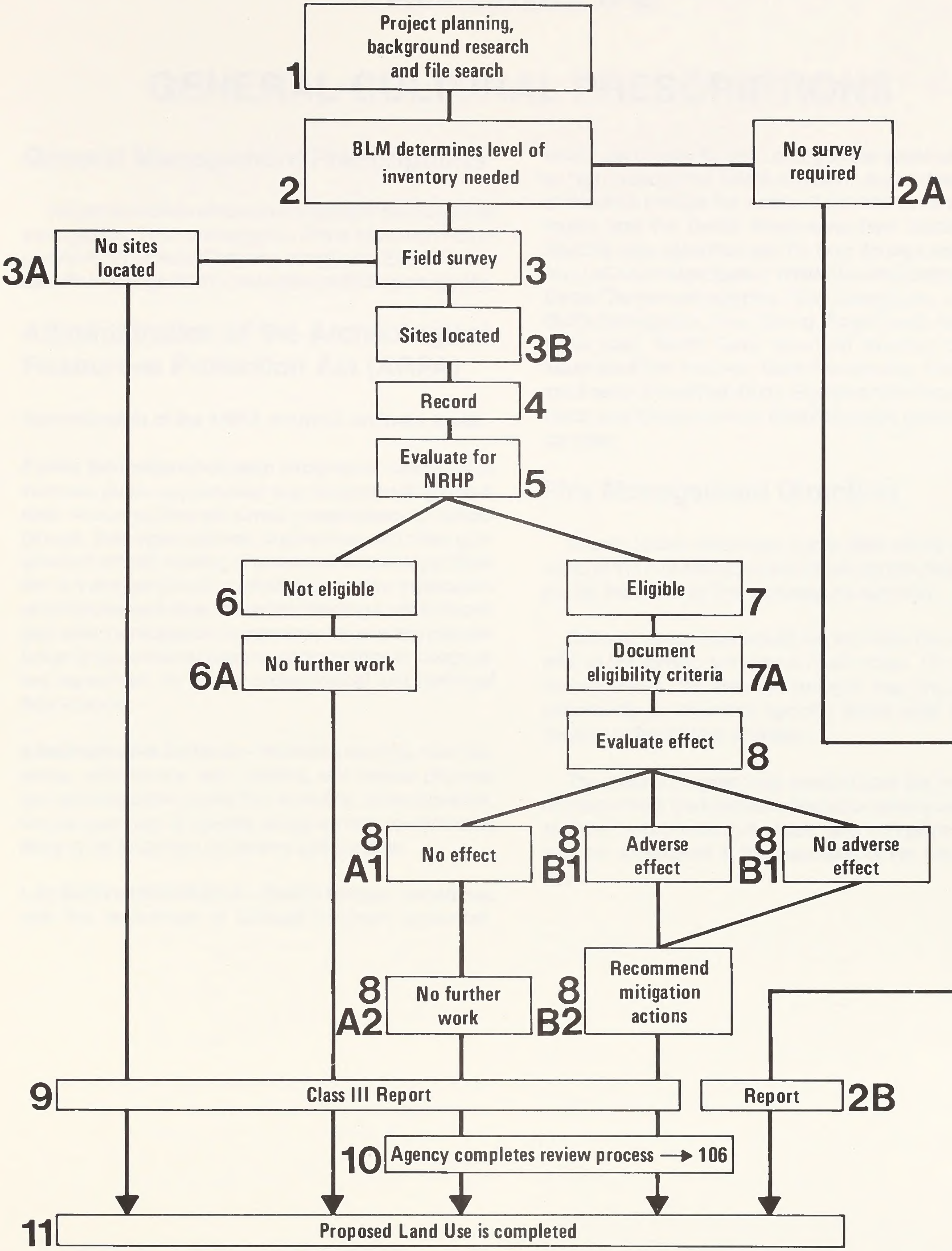


Figure 16
Cultural Resources Process

APPENDIX 6-2

GENERAL CULTURAL PRESCRIPTIONS

General Management Prescriptions

Initiate formal law enforcement patrol of the Sugarloaf petroglyphs, Tolar petroglyphs, White Mountain Petroglyphs ACEC, Cedar Canyon petroglyphs, Eden-Farson site, Pine Springs ACEC, and LaBarge Bluffs petroglyphs.

Administration of the Archeological Resources Protection Act (ARPA)

Administration of the ARPA will focus on three areas:

Public Education/Outreach Programs—designed to increase public appreciation and understanding of cultural resources through formal presentations to school groups, civic organizations, businesses, and other government offices; hosting of an annual Archeology Week fair at a shopping mall or other large facility; publication of brochures and other materials; leading tours to important sites; participation in academic forums and presentation of professional papers; sponsorship; or cooperative agreement for formal archeological and historical field schools.

Administrative Controls—including fencing, road closures, withdrawals, sign posting, and similar physical and administrative protection including, when possible, formal inventory of specific areas identify identified as likely to be impacted by looters and vandals.

Law Enforcement Patrol—District Ranger, sometimes with the assistance of Cultural Program personnel, would patrol specific sites and general areas identified as high potential for ARPA violation. Areas designated at this time include the Adobe Town-Monument Valley region and the Devils Playground-Twin Buttes area. Specific sites identified are the Dug Springs stage station, LaClede stage station, White Mountain petroglyphs, Cedar Canyon petroglyphs, Tolar petroglyphs, LaBarge Bluffs petroglyphs, Pine Spring, Sage Creek Mountain burial sites, North Table Mountain stratified site and associated site complex, Eden-Farson site, Finley site, and Farson Fossil Fish Beds, Eighteenmile Canyon Fish Beds, and Canyon Creek Fossil Rookery paleontological sites.

Fire Management Direction

Known Native American grave sites would be provided to the Fire Management Officer so that they would not be impacted by fire suppression activities.

Cultural inventories would not normally be required prior to fire fighting activities in most cases. On a case-by-case basis, the area archeologist may request the opportunity to inventory specific areas prior to their impact by firefighting activities.

The cultural program may conduct post-fire inventory of areas where fire lines were bladed or other substantial surface disturbance took place, and mitigation efforts may be undertaken at the discretion of the Area Manager.

APPENDIX 7-1

PROCEDURES FOR OIL AND GAS APPLICATION PROCESSING IN AREAS OF SEASONAL RESTRICTION

Upon receipt of application, the project location is reviewed against the resource management plan (RMP) to determine conformance with the plan and to identify existing resource concerns in the project area. An APD is posted for 30 days for public review.

Gather existing National Environmental Policy Act (NEPA) documents pertinent to the proposal or the project area.

Review the proposal against existing environmental documents and the RMP to determine whether existing documentation is adequate.

If existing documentation is adequate, prepare an Administrative Determination (AD) including appropriate mitigation measures (see Wyoming Instruction Memorandum WY-90-346).

If existing documentation is insufficient or nonexistent, prepare NEPA documentation as needed using appropriate format (see BLM NEPA Handbook, H-1790-1).

Issue decision on the application consistent with the AD or tiered NEPA document as appropriate.

NOTE: In seasonally crucial wildlife habitat, the approved APD will generally include a seasonal Condition of Approval (COA) because (1) the APD is valid for one year from date of issuance and BLM does not control the start-up date for project activity; and (2) field conditions during the crucial period cannot be predicted at the time of APD approval.

If a seasonally restrictive COA is needed on a lease containing no such stipulation, the decision whether to impose the restriction must also consider the reasonableness of the restriction relative to the operator's ability to exercise the benefits of the lease (43 CFR 3101.1-2).

If a restrictive COA is specifically determined to be unreasonable by the Authorized Officer, mitigating measures must be considered (e.g., suspension of operations and production, alternative scheduling or development scenarios, etc.).

Procedures for Handling Requests for Exception from Seasonal Stipulations and/or Conditions of Approval

A request for exception must be initiated in writing by the operator. This may be done concurrently with submission of an application (typical for situations involving lease stipulations), or subsequent to permit approval (in the case of COAs attached to approved permit).

When requested concurrently with an application, the exception from a stipulation or from a COA is considered as part of the project proposal in RMP and NEPA compliance review.

For separate requests, the request is considered as a unique action and is analyzed and documented individually for RMP and NEPA compliance.

In both cases, processing includes coordination with Wyoming Game and Fish Department (WGFD) for seasonal wildlife-based lease stipulations or permit COAs.

The unpredictability of weather, animal movement and condition, etc., preclude analysis of requests related to wildlife far in advance of the time periods in question.

Analysis of requests include review of potential mitigation measures and alternatives (traffic restrictions, alternative scheduling, staged activity, etc.).

CRITERIA FOR CONSIDERING EXCEPTIONS TO SEASONAL RESTRICTED ACTIVITY

Presently, land use activities within the Green River Resource Area may be authorized with a seasonal restriction(s), "no surface occupancy" or a distance restriction for sensitive and crucial habitats. Stipulations were developed to provide protection of natural resources. Protective wildlife seasonal stipulations are developed consistent with statewide dates. For example, big game crucial winter ranges are protected from November 15 through April 30. This restriction is not intended to close an area to development but is in place to protect big game if weather or other habitat needs dictate that it is necessary.

Over the past few years the public has received the impression that crucial winter ranges are off limits to any activity. This is true only when conditions dictate. The BLM can and does grant exceptions to seasonal stipulations if the wildlife biologist, in consultation with the Wyoming Game and Fish Department, feels that granting an exception will not jeopardize the population being protected. Wildlife biologists use a set of criteria when considering a request for an exception. Professional judgement plays a key part in the Bureau's biologist's recommendation to the Area Manager to grant or not grant exception(s). There is no clear cut formula.

Approximately 60 percent of the Federal land acres (2,331,000 acres) in the resource area have no wildlife restrictions. Following are some of the factors considered by the wildlife biologist to determine if a request for exception should be granted.

Big Game Winter Ranges

The criteria used for crucial big game winter range are those areas available, relatively intact, and winter most of the population at its objective in adequate body condition, eight or more years out of ten. The most crucial time period for these animals in the Green River Resource Area is usually from

January 1 through March 15, although the standard statewide stipulation allows the authorized officer to enforce a longer seasonal restriction if conditions warrant.

A. General Considerations Regarding a Request for Exception

— Are the factors leading to the inclusion of the wildlife seasonal restriction still valid?

— Is the request for an exception from a lease stipulation or is it for relief from a condition of approval on an application (e.g., APD, SN, ROW)?

— What are the dates for the proposed exception/relief?

B. Criteria to Consider for Granting Exceptions on Winter Ranges:

1. Animal presence or absence

2. Animal condition

3. Weather severity
   - snow conditions (depth, crusting,longevity)
   - seasonal weather patterns
   - wind chill factors (indication of animals energy use)
   - air temperatures & variation
   - duration of condition
   - forecasts - long range for duration of winter

4. Habitat Condition and Availability.
   - animal density, high or low
   - forage condition, good or poor
   - competition — livestock/other wildlife
   - forage availability
   - amount of forage
   - snow depth
   - has livestock use decreased available winter forage
   - is there suitable and ample forage immediately available and accessible nearby that is not being used

5. Site Location
   - likelihood of animals habituating to activity
   - presence of thermal cover, wind cover, etc.
   - what proportion of winter range is affected
   - where is the site located within the winter range
   - is there other activity in the area and is this activity likely to increase the cumulative adverse impact

6. Timing
   - early in winter season
   - nearing end of winter season
   - what kind of and length of disruptive activity is expected
   - how much of the winter is remaining when activity is likely to occur

General Considerations for Granting Exceptions to Stipulations

Elk

— Short-term exceptions are more likely to be considered early (November 15 -December 1) and late (April 1 - April 30) in the winter season, depending on weather conditions and animal occupancy. Exceptions would not be granted if requested from December 1 - March 1 unless unusually mild winter conditions prevail. Exceptions in elk calving areas (May 1 - June 30) dates will not be granted due to elk sensitivity to disturbance. Displacement in open habitats is much greater than woodlots or forests, hence restricted areas will encompass larger areas in open habitat.

Moose

— Exceptions will depend on weather conditions and presence of animals.

— Moose habitat is given protection through riparian and stream buffer zone stipulations (500 feet from live water and riparian habitats).

Antelope

— Exceptions will generally be granted except where physical barriers (i.e., Highways, fences, rivers, canyons, etc.) limit animals ability to move into other suitable habitats. In the case of developing oil and gas fields with proposed intensive or disruptive disturbances, BLM and WGFD coordination will be required to assure that cumulative disturbance and/or range competition with other big game and livestock will not affect herd unit objectives. Exceptions to restrictions will be closely watched during severe winters when antelope movement is restricted.

Deer

— Short-term exceptions may be granted early (November 15 - December 1) and late (April 1 - April 30) depending on weather conditions and animal occupancy, using the previously discussed criteria. Exceptions can be granted for north slopes, deep snow areas or other habitats within crucial ranges hich preclude use by wintering deer and in which access roads are determined to have little adverse impact.

Raptors

— The "no surface occupancy" stipulation of February 1 to July 30, within ½ mile of raptor nests can be shortened, depending on nesting chronology of individual species, nest site location, and topography. Inactive nests can be excepted, as may certain types of short-term, minor disruption land use activities which are not anticipated to affect nesting success.

Sage Grouse

A "no surface occupancy" stipulation will be applied to a ¼ mile radius of active sage grouse strutting grounds to include no aboveground facilities (power lines, storage tanks, fences, etc.). Linear disturbances such as low-traffic roads, pipelines, seismic activity, etc., could be granted exceptions. A "no surface disturbance" stipulation will be applied from February 1 through May 15, within ¼ mile radius of active strutting grounds from 6 p.m. to 8 a.m. daily. The actual timing of this stipulation can be modified by weather conditions such as fog and cloudy conditions, or clear, bright moonlit nights.

The final determination for granting an exception to wildlife stipulations will be a decision by the Bureau of Land Management after consultation with the Wyoming Game and Fish Department.

APPENDIX 7-2

STANDARD PRACTICES APPLIED TO SURFACE-DISTURBING ACTIVITIES

The following are general standard operating procedures applied to surface disturbing activities. These measures are applied, when necessary, to reduce environmental impacts. Some projects may require construction use plans and(or) erosion control and restoration plans.

Roads

Recognized roads, as shown on the Rock Springs District Office Transportation Plan, will be used when the alignment is acceptable for the proposed use. Generally, roads will be required to follow natural contours; be constructed in accordance with standards as described in BLM Road Standards and BLM Manual section 9113; and be reclaimed to BLM standards.

To control or reduce sediment from roads, guidance involving proper road placement and buffer strips to stream channels, graveling, proper drainage, seasonal closure, and in some cases, redesign or closure of old roads will be developed when necessary. Construction may also be prohibited during periods when soil material is saturated, frozen, or when watershed damage is likely to occur.

On newly constructed roads and permanent roads, the placement of topsoil, seeding, and stabilization will be required on all cut and fill slopes unless conditions prohibit this (e.g., rock). No unnecessary side-casting of material (e.g., maintenance) on steep slopes will be allowed. Snow removal plans may be required so that snow removal does not adversely affect reclamation efforts or resources adjacent to the road.

Reclamation of abandoned roads will include requirements for reshaping, recontouring, resurfacing with topsoil, installation of water bars, and seeding on the contour. The removal of structures such as bridges, culverts, cattleguards, and signs usually will be required. Stripped vegetation will be spread over the disturbance for nutrient recycling, where practical. Fertilization or fencing of these disturbances will not normally be required. Additional erosion control measures (e.g., fiber matting) and road barriers to discourage travel may be required.

Road closures may be implemented during crucial periods (e.g., wildlife winter periods, spring runoff, and calving and fawning seasons).

Well Pads and Facilities

Abandoned sites must be satisfactorily rehabilitated by the lessee in accordance with a plan approved by BLM. On well pads and larger locations, the surface use plan will include objectives for successful reclamation including: soil stabilization, plant community composition, and desired vegetation density and diversity. No surface disturbance is recommended on slopes in excess of 25 percent unless erosion controls can be ensured and adequate revegetation is expected. Engineering proposals and revegetation and restoration plans will be required in these areas.

On producing locations, operators will be required to reduce slopes to original contours (not to exceed 3:1 slopes). Erosion control measures will be required after slope reduction. Facilities will be required to approach zero runoff from the location to avoid contamination and water quality degradation downstream. All unused portions of facilities or producing well locations will be resurfaced with topsoil and seeded with soil stabilizing species. Mulching, erosion control measures, and fertilization may be required to achieve acceptable stabilization.

Snow fences, placed to increase snowfall accumulation over a reclaimed area, and reshaping to create shallow depressions (to catch surface runoff) may be required in areas receiving 10 inches or less of annual precipitation.

No sour gas lines would be located closer than one mile to a populated area or sensitive receptor. The applicants must use the best available engineering design (e.g., alignment, block valve type and spacing, pipe grade), and best construction techniques (e.g., surveillance, warning signs) as approved by the Authorized Officer to minimize both the probability of rupture and radius of exposure in the event of an accidental pipeline release of sour gas. A variance from the one-mile distance may be granted by the Authorized Officer based on detailed site-specific analysis that would consider meteorology, topography, and special pipeline design and(or) construction measures. This analysis would ensure that populated areas and sensitive receptors would not be exposed to an increased level of risk.

Existing crowned and ditched roads will be used for access where possible to minimize surface disturbances. Where possible, clearing of pipeline and communication line rights-of-way will be accomplished with the least degree of disturbance to topsoil. Where topsoil removal is necessary, it will be stockpiled (wind-rowed) and respread over the disturbance after construction and backfilling are completed. Vegetation removed from the right-of-way will also be required to be respread to provide protection, nutrient recycling, and a natural seed source.

To promote soil stability, the compaction of backfill over the trench will be required (not to extend above the original ground level after the fill has settled). Water bars, mulching, and terracing will be required, as needed, to minimize erosion. Instream protection structures (e.g., drop structures) may be required in drainages crossed by a pipeline to prevent erosion. The fencing of linear disturbances near livestock watering areas may be required.

Air Quality Protection Measures

As projects are planned that include possible major sources of air pollutant emissions, special air quality protection related stipulations are added to BLM permits and rights-of-way grants. In addition, the BLM coordinates with the Wyoming Department of Environmental Quality/Air Quality Division during the process of analysis. This coordination often results in the technical review of applications for permits and(or) identification of additional stipulations to be applied to these permits.

The release of hazardous air contaminants, particularly the emissions from sour natural gas sweetening plants (a process used to remove H_2S from natural gas resulting in the emission of sulfur dioxide), is a public concern. BLM requires industry to prepare analyses of risks involved with the development of sour gas pipelines and treatment facilities. These analyses are designed to project impacts both to the public and to resource values. To aid in achieving these goals, BLM will consult with the State of Wyoming, the U.S. Forest Service, industry, and the public to ensure that the most technically sound, environmentally balanced, and economically feasible decisions are made.

Reclamation

Only areas needed for construction would be allowed to be disturbed. Reclamation (by the lessee or grant holder) will be initiated as soon as possible after a disturbance occurs. Continued efforts will be required until satisfactory vegetation cover is established and the site is stabilized.

Topsoil

Before a surface disturbing activity is authorized, topsoil depth will be determined. The amount of topsoil to be removed, along with topsoil placement areas, will be specified in the authorization. The uniform distribution of topsoil over the area to be reclaimed will be required, unless conditions warrant a varying depth. On large surface-disturbing projects (e.g., gas processing plants) topsoil will be stockpiled and seeded to reduce erosion. Where feasible, topsoil stockpiles will be required to be designed to maximize surface area to reduce impacts to soil microorganisms. It is recommended that stockpiles be no more than 3 to 4 feet high. Areas used for spoil storage will be required to be stripped of topsoil before spoil placement. The replacement of topsoil after spoil removal will be required.

Temporary disturbances which do not require major excavation (e.g., small pipelines and communication lines) may be stripped of vegetation to ground level using mechanical treatment, leaving topsoil intact and root mass relatively undisturbed.

On all areas to be reclaimed, seed mixtures will be required to be site-specific and will be required to include species promoting soil stability. Livestock palatability and wildlife habitat needs will be given consideration in seed mix formulation. Interseeding, secondary seeding, or staggered seeding may be required to accomplish revegetation objectives. During rehabilitation of areas in important wildlife habitat, provision will be made for the establishment of native browse and forb species, if determined to be beneficial for the habitat affected.

Follow-up seeding or corrective erosion control measures may be required on areas of surface disturbance which experience reclamation failure.

Trees, shrubs, and ground cover (not to be cleared from rights-of-way) will require protection from construction damage. Backfilling to preconstruction condition (in a similar sequence and density) will be required. The restoration of normal surface drainage will also be required.

Any mulch used will be free from mold, fungi, or noxious weed seeds. Mulch may include native hay, small grain straw, wood fiber, live mulch, cotton, jute, synthetic netting, and rock. Straw mulch should contain fibers long enough to facilitate crimping and provide the greatest cover.

The grantee or lessee will be responsible for the control of all noxious weed infestations on surface disturbances. Control measures will adhere to those allowed in the Rock Springs District Noxious Weed Control EA (USDI 1982a) or the Regional Northwest Area Noxious Weed Control Program EIS (USDI 1987).

APPENDIX 7-3

OIL AND GAS OPERATIONS

GEOPHYSICAL EXPLORATION

Oil and gas can be discovered by either direct or indirect exploration methods such as the mapping of rock outcrops, seeps, borehole data, and remote sensing data. In many cases indirect methods, such as seismic, gravity, and magnetic surveys are required to delineate subsurface features which may contain oil and gas.

Gravity Surveys

Gravitational prospecting detects micro-variations in gravitational attraction caused by the differences in the density of various types of rock. Gravity data is used to generate anomaly maps from which faults and general structural trends can be interpreted. These surveys are generally not considered definitive due to the many data corrections required (e.g., terrain, elevation, latitude, etc.) and the poor resolution of complex subsurface structures. The instrument used for gravity surveys is a small portable device called a gravimeter. Generally measurements are taken at many points along a linear transect and the gravimeter is transported either by backpack, helicopter, or off-road vehicle. The only surface disturbance associated with gravity prospecting is that caused by a vehicle, if used.

Geomagnetic Surveys

Magnetic prospecting is most commonly used for locating metallic ore bodies but is used to a limited extent in oil and gas exploration. Magnetic surveys use an instrument called a magnetometer to detect small magnetic anomalies caused by mineral and lithologic variations in the earth's crust. These surveys can detect large trends in basement rock and the approximate depth to those basement rocks, but in general they provide little specific data to aid in petroleum exploration. Many data corrections are required to obtain reliable information and maps generated lack resolution and are considered preliminary. Magnetometers vary greatly in size and complexity and in general most magnetic surveys are conducted from the air by suspending a magnetometer under an airplane. Magnetic surveys conducted on the ground are nearly identical to gravity surveys and surface disturbance is minimal to nonexistent.

Seismic Reflection Surveys

Seismic prospecting is the best and most popular indirect method currently utilized for locating subsurface structures which may contain oil and(or) gas. Seismic energy (shock waves) is induced into the earth using one of several methods. As these waves travel downward and outward they encounter various rock strata, each having a different seismic velocity. As the wave energy encounters the interface between rock layers where the lower layer is of lower velocity some of the seismic energy is reflected upward. Sensing devices commonly called geophones are placed on the surface to detect these reflections. The geophones are connected to a data recording truck which stores data on magnetic tape. The time required for the shock waves to travel from the shot point down to a given reflector and back to the geophone can be related to depth.

There are many methods available today which an explorationist can use to induce the initial seismic energy into the earth. All methods require preliminary surveying and laying of geophones. The thumper and vibrator methods pound or vibrate the earth to create a shock wave. Usually four large trucks are used, each equipped with vibrator pads (about four-foot square). The pads are lowered to the ground and vibrators on all trucks are triggered electronically from the recording truck. Information is recorded and then the trucks move forward a short distance and the process is repeated. Less than 50 square feet of surface area is required to operate the equipment at each test site.

The drilling method utilizes truck-mounted drills which drill small-diameter holes to depths of 100 to 200 feet. Four to twelve holes are drilled per mile of line. Usually, a 50-pound charge of explosives is placed in the hole, covered, and detonated. The detonated explosive sends energy waves below the earth's surface which are reflected back to the surface from various subsurface rock layers. In rugged topography, a portable drill is sometimes carried in by helicopter. Charges are placed in the hole as in a truck-mounted operation. Another portable technique is to carry the charges in a helicopter and place the charges on wooden sticks, or lath, three feet or so above the ground. Charges used are either 2 1/2 or 5 pounds. Usually, 10 charges in a line on the ground are detonated at once. In remote areas where there is little known subsurface data, a series of short seismic lines may be required to determine the attitude of subsurface formations. After this, seismic lines will be aligned relative to the regional structure to make seismic interpretation more accurate.

The seismic sensors and energy source are located along lines on a one- to two-mile grid. Although alignment may be fairly critical, spacing of the lines can often be changed one-quarter mile on a one-mile grid before the results will significantly affect the investigation program.

A typical drilling seismic operation may utilize 10 to 15 men operating five to seven trucks. Under normal conditions, 3 to 5 miles of line can be surveyed each day using the explosive method. The vehicles used for a drilling program include several heavy truck-mounted drill rigs, water trucks, a computer recording truck, and several light pickups for the surveyors, shot hole crew, geophone crew, permit man, and party chief. Public roads and existing private roads and trails are used. Off-road cross-country travel may be necessary to carry out tasks. Motor graders and(or) dozers may be required to provide access to remote areas. Several trips a day are made along a seismograph line; this usually establishes a well defined two-track trail. Drilling water, when needed, is usually obtained from the nearest source.

Each of the foregoing methods have inherent strengths and weaknesses and explorationists must decide which method is the most practical with regard to surface constraints (such as topography) but will still produce information which can be useful for the particular study. Extensive computer processing of the raw data is required to produce a useable seismic section from which geophysicists may interpret structural relationships to depths of 30,000 feet or more. The effective depth of investigation and resolution are determined to some degree by which method is used.

Geophysical Management (Permitting Process)

Geophysical operations on and off an oil and gas lease are reviewed by the federal surface management agency - BLM, Bureau of Reclamation, or Forest Service, as appropriate. Good administration and surface protection on geophysical operations can only be accomplished through close cooperation of the operator and affected agency. Over a 16-year period (from 1975 through 1990) the Resource Area has processed 256 seismic exploration notices or permits (Table A-7-1) on public lands. An average of 16 notices or permits can be expected to be processed in any year.

TABLE A-7-1

SEISMIC EXPLORATION PERMITS ON PUBLIC LANDS

Year	Number of Permits Approved
1975	38
1976	16
1977	15
1978	18
1979	10
1980	9
1981	27
1982	21
1983	14
1984	12
1985	14
1986	7
1987	8
1988	11
1989	12
1990	24
1991	14
Total	**270**

The responsibilities of the geophysical operator and the Area Manager during geophysical operations are as follows (USDI 1989b):

1. Geophysical Operator - An operator is required to file with the Area Manager a "Notice of Intent to Conduct Oil and Gas Exploration Operations." The "Notice of Intent" shall include a map showing the location of the line, all access routes, and ancillary facilities. The party filing the "Notice of Intent" shall be bonded. A copy of the bond or other evidence of satisfactory bonding shall accompany the Notice.

For geophysical operation methods involving surface disturbance, a cultural resources survey may also be required. A pre-work field conference may be conducted. Earth-moving equipment shall not be used without prior approval. Upon completion of operations, including any required rehabilitation, the operator is required to file a "Notice of Completion of Oil and Gas Exploration Operations."

2. Area Manager - The Area Manager shall contact the operator after the "Notice of Intent" is filed and apprise the operator of the practices and procedures to be followed prior to commencing operations on BLM-administered lands.

The Area Manager shall complete a final inspection and notify the operator if the terms and conditions of the "Notice of Intent" have been met or that additional action is required. Consent to release the bond or termination of liability shall not be granted until the terms and conditions have been met.

State Standards

In Wyoming, the operator is required to register with the State. State standards for plugging shot holes, personnel safety, etc., will be followed.

Mitigation

Seasonal restrictions are imposed to reduce conflicts with wildlife, watershed damage, and hunting activity.

The most critical management practice is compliance monitoring during and after seismic activity. Compliance inspections during the operation ensure that stipulations are being followed. Compliance inspections upon completion of work ensure that the lines are clean and the drill holes are properly plugged.

OIL AND GAS LEASING

The Mineral Leasing Act provides that all public lands are open to oil and gas leasing unless a specific order has been issued to close an area. Based on the Federal Onshore Oil and Gas Leasing Reform Act of 1987, all leases must be exposed to competitive interest.

Lands which do not receive competitive interest will be available for noncompetitive leasing for a period not to exceed two years. Competitive sales will be held at least quarterly and by oral auction.

Competitive leases are issued for a term of 5 years or for as long as oil and/or gas is produced. Noncompetitive leases are issued for a term of 10 years, or as long as production continues.

The Federal Government receives yearly rental fees on non-producing leases. Royalty on production is received on producing leases, one half of which is returned to the State of Wyoming.

DRILLING PERMIT PROCESS

A federal lessee or operator is governed by procedures set forth by the Onshore Oil and Gas Order No. 1, "Approval of Operations on Onshore Federal and Indian Oil and Gas Leases," issued under 43 CFR 3164. Operating Order No. 1 lists the following as pertinent points to be followed by the lessee or operator: notice of staking; application for permit to drill (APD), which includes a multi-point surface use and operations plan; approval of subsequent operations; well abandonment; water well conversion; responsibilities on privately owned surface; and reports and activities required after well completion.

The federal lessee or operating company selects the location of a proposed drill site. The selection of the site is based on spacing requirements, the subsurface geology as interpreted by geologists and geophysicists, the topography, and the availability of funds for a specific well. Spacing requirements are established by the Wyoming State Oil and Gas Commission. Each well is to be drilled within a given distance from the center of a legal subdivision (such as a quarter/quarter of a section or a quarter section, depending on the spacing assigned to the particular area). A proposed location may be moved within the tolerance or outside the designated tolerance (with a spacing exception granted by the Oil and Gas Commission). Occasionally, the Bureau may request that a lessee drill a well on the lease if it is determined that federally owned minerals are being drained by an adjacent well on private or state owned minerals (USDI 1981a).

1. Notice of Staking - After the company makes the decision to drill a well, they must decide whether to submit a notice or APD. The notice consists of an outline of what the company intends to do including a location map and sketched site plan. The notice is then used as a document to review any conflicts with known critical resource values, and also used at the on-site inspection to provide the preliminary data to assess what additional items are necessary to complete the APD.

2. Application for Permit to Drill (APD) - The operator or lessee may submit a completed APD in lieu of notice of staking, but in either case no surface activity is conducted in conjunction with the drilling until the APD is approved by the Bureau.

If the APD option is used, an APD is submitted to the Bureau and a field inspection is held with the operator and any other interested party. The purpose of the pre-site field inspection is to evaluate the operator's plan, to assess the situation for possible mpacts (surface and subsurface), and to formulate resource protection stipulations. To lessen environmental impacts, a site may be moved, reoriented, or redimensioned, within certain limits, at the pre-site inspection. The proposed access road may also be rerouted (USDI 1981a). If necessary, site-specific mitigations are added to the APD for protection of surface and/or subsurface resource values in the vicinity of the proposed activity.

The Bureau is responsible for preparing environmental documentation necessary to satisfy the National Environmental Policy Act requirements and provide any mitigation measures needed to protect the affected resource values.

Consideration is also given to the protection of ground water resources. When processing an APD, the geologist is required to identify the maximum depth of usable water as defined in Onshore Oil and Gas Order No. 2. Usable water is defined as that water containing 10,000 parts per million or less of total dissolved solids. Water of this quality is to be protected, usually by surface casing and cement.

Determining the depth to fresh water requires specific water quality data in the proposed well vicinity or geophysical log determination of water quality, depending on existing well proximity and log availability. If water quality data or logs from nearby wells are not available, the area within a 2-mile radius of the proposed well is checked for water wells. If wells exist, surface casing is required to be set below the deepest fresh water zone found in these wells or to reach a depth below the reasonably estimated level of usable water.

When final approval is given by the BLM, the operator may commence construction and drilling operations. Approval of an APD is valid for one year. If construction does not begin within one year, the stipulations must be reviewed prior to approving another APD (USDI 1981a).

Economic conditions dramatically affect drilling activity and at the present time oil and gas markets are depressed nationwide. However, an upturn in the petroleum market could create a significant increase in the number of drilling wells within the Resource Area as the entire area has high potential for oil and gas occurrence. Increases in activity have occurred over the past 3 years (1988, 1989, 1990), due to increased interest in obtaining gas to supply the Kern River gas pipeline to California. The resource area approved 74 drilling applications in fiscal year 1988, 81 in 1989, and 115 in 1990.

In the Resource Area, drilling depths range from a few thousand feet in the Rock Springs area to over 18,000 feet on the southern part of the Moxa Arch. The vast majority of the wells drilled in the resource area require 30 to 90 days to drill and complete. Some deep wildcats (17,000 to 20,000 feet) may require a year or more to drill and complete.

Surface Disturbance Associated With Exploratory Drilling

Upon receiving approval to drill the proposed well, the operator moves construction equipment over existing roads to the point where the access road will begin. Generally, the types of equipment include dozers (track-mounted and rubber-tired), scrapers, and motor-graders. Moving equipment to the construction site requires moving several loads (some overweight and overwidth) over public and private roads. Existing roads and trails are improved in places and occasionally culverts and cattleguards are installed if required.

The length of the access road varies. Generally the shortest feasible route is selected to reduce the haul distance and construction costs. Environmental factors or the landowner's wishes may dictate a longer route. In rough terrain, the type of construction is sidecasting (using the material taken from the cut portion of the road to construct the fill portion); slightly less than one-half of the road bed is on a cut area and the rest is on a fill area. Roads are usually constructed with a 14-foot (single lane) or 24-foot (double lane) running surface (in relatively level terrain). Soil texture, steepness of the topography, and moisture conditions may dictate surfacing the access road in some places but generally not for the entire length. The total acreage disturbed for each mile of access road constructed varies significantly with the steepness of the slope.

Well locations are constructed by one of three different general types of construction, but in every case, all soil material suitable for plant growth is first removed from areas to be disturbed and stockpiled in a designated area. Sites on flat terrain usually require little more than removing the topsoil material and vegetation. Drilling sites on ridge tops and hillsides are constructed by cutting and filling portions of the location. The majority of the excess cut material is stockpiled in an area that will allow it to be easily recovered for rehabilitation. It is important to confine extra cut material in stockpile rather than cast it down hillsides and drainages where it cannot be recovered for rehabilitation.

The amount of level surface required for safely assembling and operating a drilling rig varies with the type of rig, but averages 300 feet by 350 feet. Figure 17 illustrates a typical well location layout. At least 25 feet is normally required to be on an area of cut instead of fill, between the drill point and the outer edge of the drilling platform. This ensures that the foundation of the drilling derrick is on solid ground and prevents it from leaning or toppling due to settling of uncompacted soil.

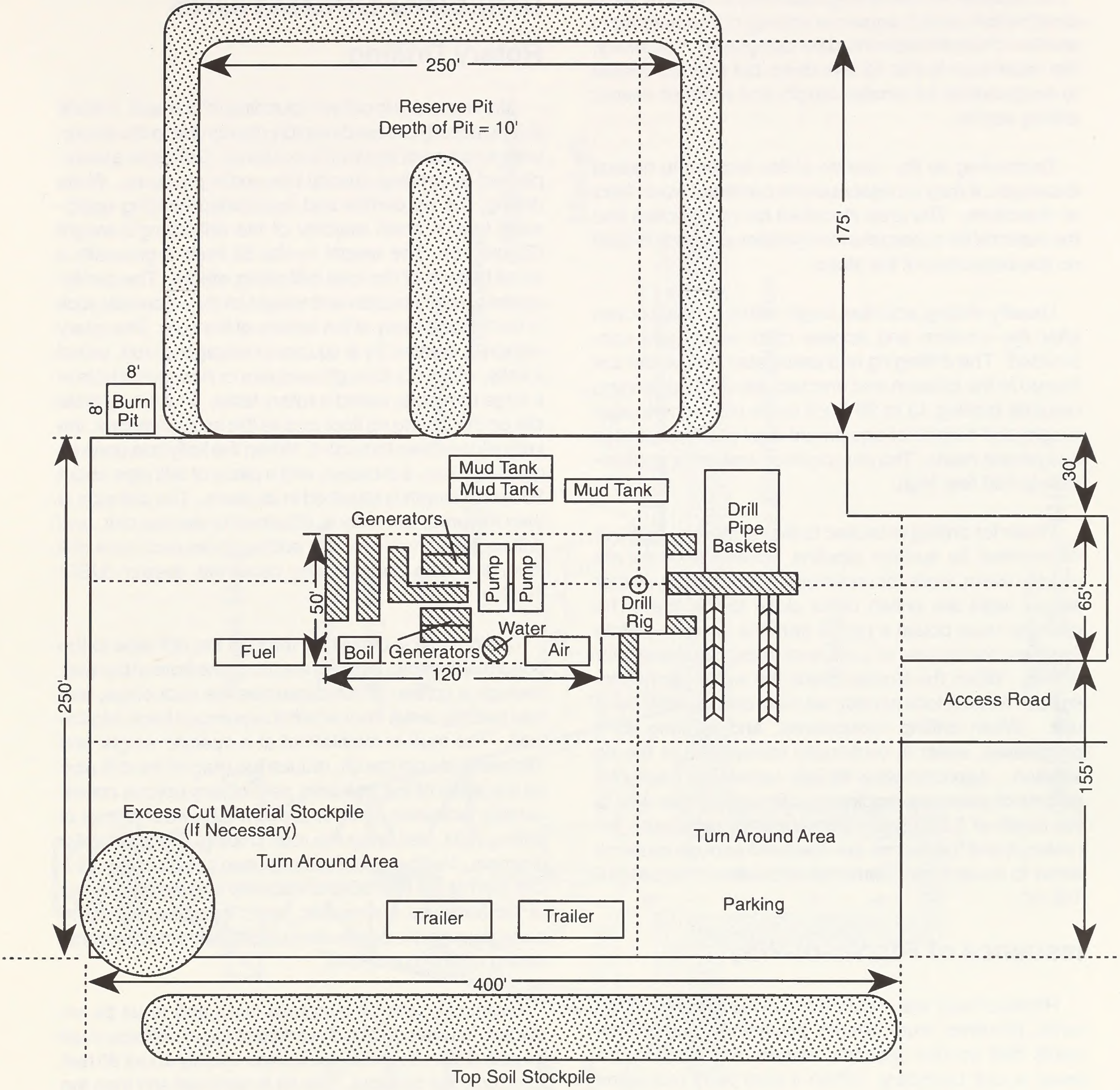


Figure 17
Location Layout for a Well 9,000 to 15,000 Feet Deep

In addition to the drilling platform, a reserve pit is constructed, usually square or oblong, but sometimes in another shape to accommodate topography. Generally, the reserve pit is 8 to 12 feet deep, but may be deeper to compensate for smaller length and width or deeper drilling depths.

Depending on the relation of the location to natural drainages, it may be necessary to construct water bars or diversions. The area disturbed for construction and the potential for successful revegetation depends largely on the steepness of the slope.

Usually drilling activities begin within a week or two after the location and access road have been constructed. The drilling rig and associated equipment are moved to the location and erected. Moving a drilling rig requires moving 10 to 25 truck loads (some over legal weight and height) of equipment over public highways and private roads. The derrick when erected is approximately 160 feet high.

Water for drilling is hauled to the rig storage tanks or transported by surface pipeline. Water sources are usually rivers, wells, or reservoirs. Occasionally, water supply wells are drilled on or close to the site. The operator must obtain a permit from the Wyoming State Engineer for the use of surface or subsurface water for drilling. When the Bureau holds the water permits for surface water (stock ponds), we must also approve such use. When drilling commences, and as long as it progresses, water is continually transported to the rig location. Approximately 40,000 barrels or 1,680,000 gallons of water are required to drill an oil or gas well to the depth of 9,000 feet. More water is required if the underground formations are fractured enough to permit water to escape into them (lost circulation zone) (USDI 1981a).

Issuance of Rights-of-Way

Rights-of-way are required for all facilities, tank batteries, pipelines, truck depots, powerlines, and access roads that occupy federally owned land outside the lease or unit boundary. When a third party (someone other than the oil or gas company and the federal government) constructs a facility or installation on or off the lease, a right-of-way is also required. The right-of-way is issued by the Bureau.

DRILLING OPERATIONS

Rotary Drilling

Starting to drill is called "spudding in" the well. Initially drilling usually proceeds rapidly mainly due to the incompetent nature of shallow formations. Drilling is accomplished by rotating special bits under pressure. While drilling, the rig derrick and associated hoisting equipment bear a great majority of the drill string's weight (Figure 18). The weight on the bit itself is generally a small fraction of the total drill string weight. The combination of rotary motion and weight on the bit causes rock to be chipped away at the bottom of the hole. The rotary motion is created by a square or hexagonal rod, called a kelly, which fits through a square or hexagonal hole in a large turntable, called a rotary table. The rotary table sits on the drilling rig floor and as the hole advances, the kelly slides down through it. When the kelly has gone as deep as it can, it is raised, and a piece of drill pipe about 30 feet in length is attached in its place. The drill pipe is then lowered, the kelly is attached to the top of it, and drilling recommences. By adding more and more drill pipe, the hole can steadily penetrate deeper (USDI 1981a).

Drilling mud is circulated through the drill pipe to the bottom of the hole, through the bit, up the bore of the well, through a screen which separates the rock chips, and into holding tanks from which it is pumped back into the well. The mud is maintained at a specific weight and thickness to cool the bit, reduce the drag of the drill pipe on the sides of the well hole, seal off any porous zones, contain formation fluids to prevent a blowout or loss of drilling fluid, and bring the rock chips to the surface for disposal. Various additives are used in maintaining the drill mud at the appropriate viscosity and weight. Some of the additives are caustic, toxic, or acidic, but these hazardous additives are used in relatively small amounts during drilling operations.

Eventually, the bit becomes worn and must be replaced. To change bits, the entire string of drill pipe must be pulled from the hole, in sections usually about 90 feet long, until the bit is out. The bit is replaced and then the drill string is reassembled and lowered into the hole, section by section, and drilling is started again. The process of removing and reinserting the drilling string uses much of the time required in drilling.

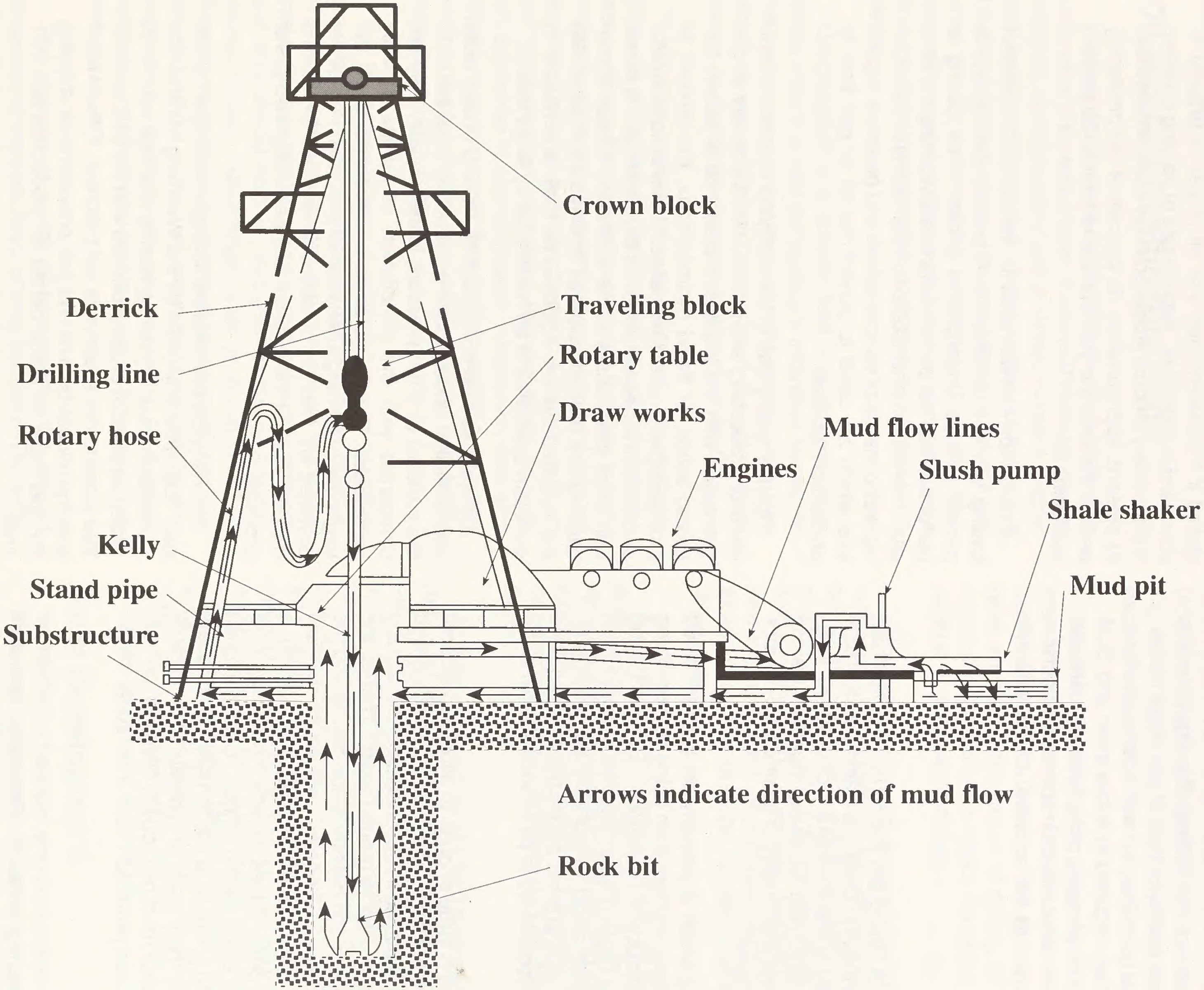


Figure 18
Diagram of Rotary Rig

Drilling operations are continuous, 24 hours a day and 7 days a week. The crews usually work three 8-hour shifts or two 12-hour shifts a day. Pickups or cars are used for workers' transportation to and from the sight.

Upon completion of the drilling, the equipment is removed to another location. If oil or gas is not discovered in commercial quantities, the well is considered dry. The operator is then required to follow state and BLM policy procedures for plugging a dry hole. The drill site and access road are rehabilitated in accordance with the stipulations attached to the approval of the well site (USDI 1981a).

Casing

Various types of casing are placed in the drilled hole to enhance hole integrity. Casing is a string of steel pipe which is comprised of many lengths (about 40 feet long) of individual pipe which are "screwed" together. Casing is cemented into the well to protect against fluids or rock entering the well bore.

Surface casing which is properly set and cemented also protects surface aquifers from being contaminated by drilling and production operations. Surface casing should be set to a depth greater than the deepest fresh water aquifer which could reasonably be developed. Fresh water may exist at great depths but these aquifers are not normally considered to be important fresh water sources.

Surface casing is large enough to allow subsequent lengths of smaller casing to be set as the well is drilled deeper. Cement is placed in the annulus of the surface casing from casing shoe to ground level. That is, the entire space between the outside of the casing and the borehole wall is filled. Generally only the bottom few hundred feet of intermediate or production casing is cemented which often leaves several thousand feet of open hole behind some casing strings. Casing in open hole (uncemented annulus) is not considered adequate to protect zones of fresh water or minerals from contamination. The annulus must be properly filled with cement to provide adequate protection from inter-zonal migration.

Currently, the operator is only required to cement off "hydrocarbon bearing zones." Generally, operators define hydrocarbon bearing zones to be those zones which produce enough oil or gas to measure, therefore, some hydrocarbon bearing zones are not cemented. Production casing or liner is intended to provide a conduit for the production of oil and gas so that little or no product is lost in "up-hole zones."

DEVELOPMENT AND PRODUCTION

Wells are completed and production quipment installed if it is determined that oil or gas is present in commercial quantities. Natural gas of varying qualities is the primary product produced in the assessment area. At present, approximately 65 percent of the producing wells in the area are gas, with the remaining 35 percent producing oil.

Completion of a well calls for the installation of steel casing, which is cemented in, to provide stability and to protect specific underground zones. The casing is perforated into the zone or structure containing the oil or gas. The equipment installed on the casing of a producing well consists of various valves and pressure regulators which are used to control the oil or gas flow to production facilities.

Pipeline quality gas at the wellhead requires a minimum of processing equipment. As the quality of gas decreases with the increased presence of water, dissolved solids, or liquid hydrocarbons, the amount of processing equipment increases. Water or liquid hydrocarbons in the gas are removed before the gas is mixed with other gas, usually at the wellhead. If liquid hydrocarbons are present, storage facilities (tank batteries) are required for the liquids until they accumulate in sufficient quantities to be hauled out by large trucks.

Oil wells can be completed as flowing (those wells with sufficient underground pressure to raise the oil to the surface) or if the pressure is inadequate, they are completed with the installation of pumps, usually pumpjacks. Pumpjacks come in a variety of sizes, the larger ones reaching a height of 30 to 40 feet. Pumps are powered by internal combustion engines or electric motors. Fuel for the engines may be casinghead gas or propane.

Wyoming law prohibits the flaring or venting of natural gas. Exceptions allowed by the Wyoming Oil and Gas Commission are: 1) during testing of a new well, or 2) when the amount of gas produced with the oil is so small that pipeline construction is not practical. Otherwise, if a well produces both oil and gas, provisions for shipping the gas must be made before oil production can continue.

The production equipment (heater-treater, holding facility for production water (if any is present), and tank battery) are either placed on a portion of the location (on cut rather than fill) or located a short distance from the wellhead along the access road. Production facility colors are required to be from the standard color chart. The heater-treater and tanks are surrounded by earthen dikes to contain accidental spills. Either all the facilities may be fenced, or only the production water pit may be fenced (USDI 1981a).

Oil and Gas Exploratory Units

Surface use in an oil or gas field may be affected by unitization of the leaseholds. In areas of federally owned minerals, an exploratory unit is formed before a wildcat exploratory well is drilled. The boundary of the unit is based on geologic data. The developers of the unit can enter into an agreement to develop and operate as a unit, without regard to separate lease ownerships. Costs and benefits are allocated according to agreed-upon terms.

Development in a unitized field may proceed more slowly than in a field composed of individual leases; in the former case, all owners within the participating area share in any well's production but in the later, each lessee must drill his own well to obtain production.

Unitization reduces the surface use requirements because all wells are operated as though on a single lease. Duplication of field processing facilities is minimized, because development and operations are planned and conducted by a single operator. Often powerlines are distributed throughout the unit and diesel engines are converted to electric motors. Unitization may also involve wider spacing than usual, resulting in fewer wells. Access roads are usually shorter and better organized (USDI 1981a).

It is the general intent of unitization to pool or unitize the interests in an entire structure or area in order to provide for adequate control of operations so that development and production can proceed in the most efficient and economical manner, and with minimized environmental impact. Accordingly, each proposal to unitize federally supervised leases must be evaluated upon its specific merits. The unit greement provides for the exploration, development, and production by a single operator. In effect the unit functions as one very large lease.

The purpose of a unit is to conserve the natural resources of the pool, field, or area involved. The early consolidation of separate exploration and development efforts through unitization of separate leasehold interests eliminates the need (with respect to drainage) to drill protective wells along common boundaries between unitized leases and serves to maximize benefits through a continuing exploration and development program.

There are extensive oil and gas exploration and production activities within the Green River Resource Area. Included within this area are 44 producing oil/gas units totalling 273,620 acres, 3 approved exploratory units (52,990 acres), and 3 proposed (designated) units (45,360 acres) for a total of 371,970 acres as of August 15, 1990. Appendix 7-4 gives relevant information on each unit (Map 89).

New field developments are analyzed in an environmental assessment or EIS after the second or third confirmation well is drilled. The operator should then have an idea of the extent of drilling and disturbance required to extract and produce the oil and gas, once the second or third well is drilled.

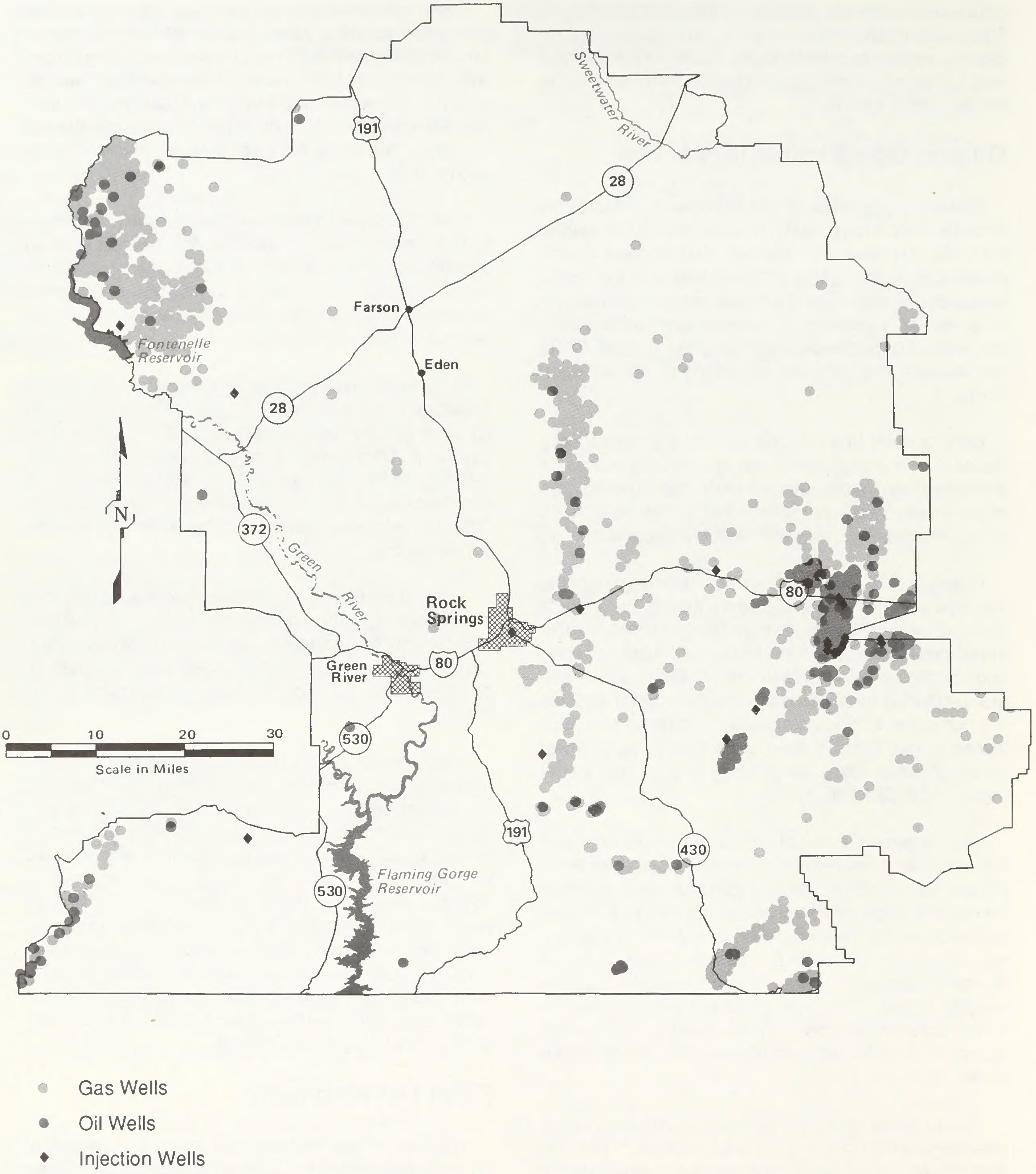
Many fields go through several development stages. A field may be considered fully developed and produce for several years; later, a well may be drilled to a deeper pay zone. Discovery of a new pay zone in an existing field is called a pool discovery, as distinguished from a new field discovery. A pool discovery may lead to the drilling of additional wells. Existing wells may also be drilled deeper.

A new stage of field development can lead to changes in locations of roads and facilities. All new construction, reconstruction, or alterations of existing facilities-including roads, dams, pits, flowlines, pipelines, tank batteries, or other production facilities-must be approved by the Bureau.

As the productive life of a field progresses, problems may arise such as erosion, unvegetated areas; washing out of drainage crossings and roads; plugging of culverts, deterioration of cattleguards; accumulation of derelict equipment; construction of unnecessary roads; unauthorized off-road cross-country travel; and improperly placed or unrehabilitated pipelines. The Bureau prepares rehabilitation plans to correct these problems and to return the field surface area to its original productivity. By adequately taking corrective action as problems arise, total rehabilitation can be accomplished within an acceptable time period after a field is completely exhausted (USDI 1981a).

Field Development

The most important factor in further development of an oil or gas field is the quantity of production. Other considerations are whether the field is on a lease basis or unitized, the probability of profitable production, the necessity to protect federal mineral acreage from drainage by off-lease drilling, and the degree to which limits of the field are known.



Map 89

Existing Oil and Gas Wells

Green River Planning Area

When an oil or gas discovery is made, a well spacing pattern must be established before development drilling begins. Well spacing is regulated by the Wyoming State Oil and Gas conservation Commission. Factors considered in the establishment of a spacing pattern include data from the discovery well concerning: porosity, permeability, pressure, composition, and depth of formations in the reservoir; well production rates and type (barrels of oil or cubic feet of gas); and the economic effect of the proposed spacing on recovery. The minimum spacing for oil production on federal leases is 40 acres. Spacing for oil wells usually varies from 40 to 320 acres per well. Spacing for gas wells is generally from 160 to 640 acres per well. Spacing requirements can pose problems in selecting an environmentally sound location. Reservoir characteristics and the drive mechanism determine the most efficient spacing to achieve maximum production. If an operator determines that a different spacing is necessary to achieve maximum recovery, the state and federal agencies may grant exceptions to the spacing requirements. Exceptions may also be obtained if the terrain is unsuitable, provided no geologic or legal problems are encountered. The procedures for obtaining approval to drill and for the drilling of development wells are generally the same as those for wildcat (exploration) wells.

As more wells are placed in production, roads are improved by regular maintenance, surfacing with gravel or scoria, and installing drainage crossings. Mineral materials are usually purchased from local contractors and obtained from federal sources. Materials that are obtained from areas of federally owned minerals require a sales contract and are processed through the Resource Area where the materials occur.

Production from several wells on one lease may be carried by pipeline to a central tank battery. Use of a central tank battery depends on whether or not the oil is from the same formation, and whether or not the partners of stockholders are the same. If commercial quantities of gas are produced with the oil, feeder lines are constructed to carry it to transportation lines.

Production

Gas, oil, and water are being produced in the area by means of natural flow and artificial lift (electric pumping units, gas pumping units, and submersible pumping units).

Gas Production: A typical gas well location would consist of a wellhead, methanol injection equipment (to keep production and surface lines from freezing), a separator (which separates gas, oil, and water), a dehydrator (uses heat and glycol or CaCl to extract any water remaining with the gas), and an orifice meter. An intermitter is sometimes used to either shut-in the well to build up pressure or to blow the well down if it is being loaded with fluid. If the gas well is producing some oil or condensate, oil tanks are used to store the oil and condensate until it is sold via truck or pipeline.

Gas which occurs with oil is separated by venting it out the top of the tank battery and into feeder lines leading to transportation lines. If enough casinghead gas is separated to make it economical for marketing, a plant may be constructed to process the gas, or a pipeline may be constructed to carry the product to an existing plant. If the volume of casinghead gas is insufficient to warrant treatment in a gas plant, it is usually used as fuel for pump engines in the field or as heating fuel for the heater-treaters. Gas is flared or vented into the atmosphere if it exceeds the fuel requirements on the lease but is not of commercial quantities.

Oil Production: In the Resource Area, oil is usually produced using artificial lift methods (pump units). Generally, production from a number of wells is treated at a central tank battery. Due to the nature of this oil, adequate separation of oil and water is only obtained through successive applications of heat. The fluid stream arrives at a separator point where the flash gas is taken off and in most cases, this flash gas is used for lease operations. The remainder of the flash gas is either compressed and sold or flared. Flash gas is defined as solution gas liberated from the oil due to expansion. Water and oil are also being separated at this point. The oil is dumped in storage tanks with the water being sent to a disposal facility. If the water content of the oil is too high due to emulsion, then the oil is recirculated back to the separator, where heat is applied again, with the process continuing until the oil is clean. Two main methods of oil measurement in the area are utilized. These are the lease automatic custody transfer meters and tank gauging. Measurement is required by 43 CFR 3162.7-2 and Onshore Order No. 4 to ensure proper and full payment of federal royalty.

Operators employ various energy sources and techniques to produce oil and gas economically. Some of the larger units are electronically controlled through a central computer facility. Pump jacks are run by electricity or gas while solar power units are employed by some to assist in instrumentation. Compressors are sometimes required to produce wells and meet pipeline pressure.

Water Production: Associated water produced with the oil or gas is disposed by trucking the water to a Department of Environmental Quality authorized disposal pit, by placing the water in lined or unlined pits, or through subsurface injection. The quality of the water often dictates the appropriate disposal method. The produced water is also sometimes used in enhanced recovery projects.

Production Problems: Weather extremes pose problems for producers by causing roads to become impassable, equipment to malfunction, and freeze-up of flowlines, separators, and tanks. Other problems producers face in the area are: H2S, CO2, paraffin, corrosion, electrolysis, and burst flowlines.

Secondary and Enhanced Oil Recovery

An oil reservoir typically contains oil, gas, and water trapped within fine rock pores under tremendous pressures. Because of the pressure, much or all of the gas is dissolved in the oil. "Primary drive" is by the expansion of pressurized water and gas in solution which forces oil out of the pores into the well and up to the surface. Oil flowing out of the rock drains energy from the formation; pressure in the reservoir begins slowly to decline; primary drive diminishes, and the production rate falls. As reservoir pressures continue to drop, gas in the oil escapes, forming bubbles in the rock pores. This further retards the flow of oil and, in time, flow all but ceases. At this point, as much as 80 percent of the original oil may still remain in the reservoir.

To keep oil flowing, pressure is required. Pumps may be used to lift oil to the surface. Currently, in the United States, these normal methods of oil recovery account for less than half of the current oil production. The rest is produced using secondary and enhanced recovery techniques. These techniques increase recovery of oil above that attainable by normal recovery.

There are two basic secondary recovery methods in use: 1) water flooding and 2) displacement by gas. The most important secondary recovery method in use is water flooding. Water flooding is the process of injecting large volumes of water into oil reservoirs where primary recovery has fallen or is expected to be low.

The process of injecting gas into the producing zone of a well is another less used secondary recovery technique. Historically, produced gas was considered a wasted product and it was flared (burned) at the point of production. Later, it was recognized that the energy could be conserved and the recovery of oil increased if the produced gas was re-injected into the producing zone. This increased production was achieved by: 1) maintaining reservoir pressure by injecting the gas into the existing gas cap, and 2) by injecting the gas directly into the oil saturated zone, creating an immiscible gas drive which displaced the oil.

In the Green River Resource Area, the East LaBarge Unit (Ts. 26-27 N., R. 112 W.) is the only field where water injection only has been used. In this unit, water was injected into the Fort Union (Almy) Formation to increase oil production.

Gas injection as a secondary recovery technique is presently being used in the Henry Unit (Ts. 13-14 N., R. 113 W.) and the Brady Deep Unit (T. 16 N., R. 101 W. and T. 17 N., R. 100 W.). In these units, gas has been injected into the producing formation to maintain pressure and allow increased oil production. In the Henry Unit, injection has been into the "Dakota Formation," while in the Brady Deep Unit is has been injected into the Tensleep (Weber) Sandstone.

Two other producing units in the Resource Area have been produced with a combination of water and gas injection methods. The Monell (T. 18 N., R. 98-99 W.) and Arch (T. 19 N., R. 98-99 W.) Units produce oil from the Almond Formation.

The term "enhanced recovery" is used to describe recovery processes other than the more traditional secondary recovery procedures. These enhanced recovery methods include thermal, chemical, and miscible (mixable) CO2 drives.

Some reservoirs contain large quantities of heavy oil that cannot be produced using normal, or secondary methods. In thermal drive processes, heat is introduced from the surface or developed in place in the subsurface reservoir. In the thermal drive process, hot water or steam is injected. In the In-Situ process, spontaneous or induced ignition of in-place hydrocarbons are created in the presence of injected air to develop an In-Situ fire front. Raising the temperature of heavy oil causes it to become less viscous and more mobile, so that it may be produced through gravity forces or preferably by displacement.

There are several chemical drive techniques currently in use, including 1) polymer flooding, 2) caustic flooding, and 3) surfactant-polymer injection. These methods attempt to change reservoir conditions to allow additional oil to be recovered.

In the recent past carbon dioxide, which is miscible with oil, has been used to enhance oil recovery. Carbon dioxide is able to mix with the oil in a reservoir allowing for greater displacement of oil.

There are no enhanced recovery projects active within the Resource Area at this time. Chemical or CO2 drives are likely to be tried in some Resource Area fields in the future. Thermal recovery techniques are not likely to be tried in the Resource Area because the oils present here are not heavy oils.

Plugging and Abandonment of Wells

The purpose of plugging and abandoning a well is to prevent fluid migration between zones, to protect minerals from damage, and to restore the surface area. Each well has to be handled individually due to a combination of factors, including geology, well design limitations, and specific rehabilitation concerns. Therefore, only minimum requirements can be established, then modified for the individual well.

The first step in the plugging process is the filing of the Notice of Intent to Abandon. This will be reviewed by both the Surface Management Agency and this Resource Area. The Notice must be filed and approved prior to plugging a past producer. Verbal plugging instructions can be given for plugging current drilling operations, but a Notice must be filed after the work is completed. If usable fresh water was encountered while the well was being drilled, the Surface Management Agency will be allowed, if interested, to assume future responsibility for the well and the operator will be reimbursed for the attendant costs.

The operator's plan for securing the hole is reviewed. The minimum requirements as stated in Onshore Order No. 2, are as follows: In open hole situations, cement plugs must extend at least 50 feet above and below zones with fluid which has the potential to migrate, zones of lost circulation (this type of zone may require an alternate method to isolate), and zones of potentially valuable minerals. Thick zones may be isolated using 100-foot plugs across the top and bottom of the zone. In the absence of productive zones and minerals, long sections of open hole may be plugged with 150-foot plugs placed every 3,000 feet. In cased holes, cement plugs must be placed opposite perforations and extending 50 feet above and below except where limited by plug back depth.

The cement plugs could be replaced with a bridge plug, if the bridge plug is set as close as practical above the open perforations; if the perforations are isolated from any open hole below; and if the perforations are squeezed with cement. The bridge plug must be capped (placed through tubing) with a minimum of 25 sacks of cement and not less than 50 feet of fill must be used. If the cap is placed using a dump bailer, a minimum of 35 feet of fill must be used, no sack minimum. A dump bailer is a wireline apparatus useful for cement placement because tubing does not have to be run and cement contamination is minimized. This method employs the use of a container of cement which is lowered into the hole and "dumped."

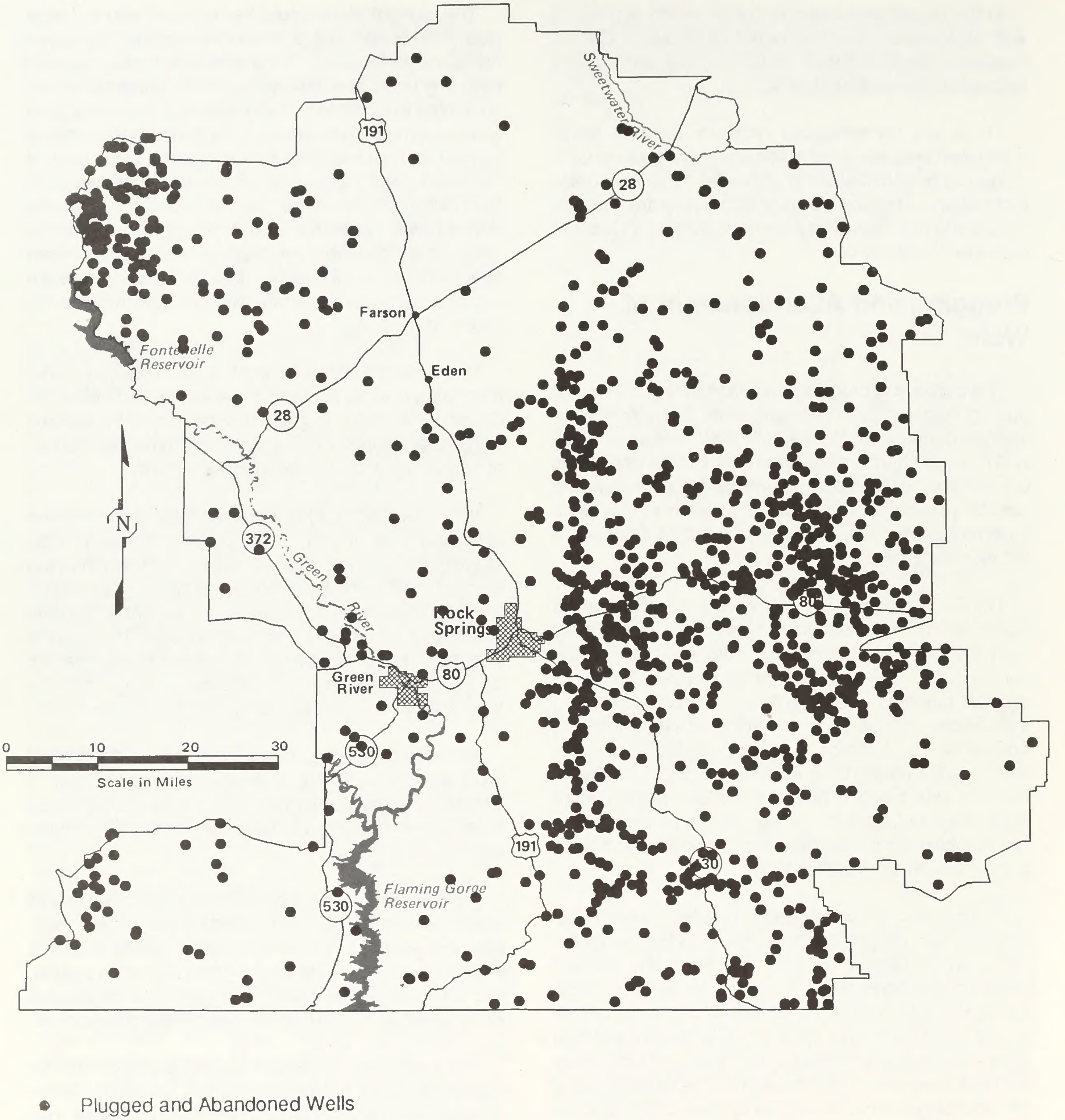
In the event that the casing has been cut and recovered, plug is to be placed 50 feet above and below the cut off point. Annular space that extends to the surface will not be left open to the drilled hole below, as 100 feet of cement must be placed in the annulars.

If the integrity of a plug is questionable or the position extremely vital, it can be tested with pressure or by tagging the plug with the drill string. Tagging the plug means running pipe into the hole until the plug is encountered and placing a certain amount of weight on the plug to verify its placement and competency. The surface plug must be a minimum of 100 feet and no less than 25 sacks of cement. The interval between plugs must be filled with mud, 9 pounds per gallon minimum.

After the casing has been cut off below the ground level, any void in the top of the casing must be filled. If a metal plate is welded over the top of the casing, weep holes should be drilled in the plate to vent the annular spaces.

A permanent abandonment marker is required on all wells unless otherwise requested by the surface management agency. This marker pipe is usually at least 4 inches in diameter, 10 feet long, 4 feet above the ground, and embedded in cement. The pipe must be capped with the well identity and location permanently inscribed.

The surface management agency is responsible for establishing and approving methods for surface rehabilitation and determining when this rehabilitation has been satisfactorily accomplished. At this point, a Subsequent Report of Abandonment can be approved. To July 1 of 1990, 1,328 wells had been drilled and abandoned in the Resource Area (Map 90).



Map 90

Abandoned Oil and Gas Wells

Green River Planning Area

SUBSURFACE PRACTICES

The success (or failure) of subsurface operations cannot be determined by simply "looking down the hole," but instead, must be judged from indirect evidence such as downhole logs, drilling data, completion data, and many other data sets. Competent professionals are required to determine the character and adequacy of "downhole" operations. A downhole failure may take many years before the ramifications become apparent at the surface; by that time, the situation may be irreversible.

Prior to 1982, the USGS was responsible for subsurface management and initiated many standards and policies for oil and gas development on federal mineral lands. Since 1982, the fluid minerals branch of the Bureau has been responsible for subsurface management.

Casing and Cementing

Early wells had just enough casing to support a wellhead and the remainder of the hole was generally open. Improper casing and cementing allows communication between zones of hydrocarbons, salt water, and fresh water.

Most standards are difficult to set in that cost is a factor and any job can be "overdesigned." Many "gray areas" exist where experts argue the merits of one design over another. One of these controversial design areas is hole size relative to casing size. It is questionable if a proper cement bond can be obtained under these circumstances. Hole deviation, depth, bore hole environment, placement of centralizers (if any), and a myriad of other factors affect the integrity of the casing and cement job. One of the most important factors influencing a "cement job" is the pumping method. Cement can be pumped and placed in any of three flow regimes: plug flow, laminar flow, and turbulent flow. The flow regime is a function of the velocity at which the slurry flows. Plug flow has a very slow velocity and takes the most time to pump. Turbulent flow requires high hydraulic horsepower and some service companies cannot pump cement in turbulent flow under certain conditions.

Blowout Prevention

In the early days of drilling, no blowout prevention equipment was used. As a result, several spectacular blowouts occurred in the northwest portion of the resource area near LaBarge.

Today, special attention is paid to blowout prevention; much of the equipment associated with drilling rigs is for handling excess pressure at the surface. Blowout prevention equipment is tested and inspected regularly by both the rig personnel and the inspection and enforcement branch of the BLM. Minimum standards and enforcement provisions are currently in effect as part of Onshore Order No. 2. Well-trained rig site personnel are a necessity for proper blowout prevention.

Casing setting depth is also important with regards to blowout prevention. The casing shoe must be set in rock which is competent to withstand the maximum anticipated pressure to which it will be exposed.

APPENDIX 7-4

OIL AND GAS UNITS

Name of Unit	Approval Date	Unit Operator	Unit Area (acres)
PRODUCING UNITS (as of August 15, 1990)			
Adobe Town	06-23-78	Koch Exploration Company	680.00
Arch	02-23-78	Union Pacific Resources Company	12,565.37
Bitter Creek II	12-12-73	Amoco Production Company	360.00
Blue Forest	12-13-82	Presidio Exploration Inc.	9,716.53
Brady (Deep)	10-18-72	Union Pacific Resources Company	5,975.61
Buccaneer	12-16-80	Apache Corporation	680.00
Butcher Knife Spring	07-20-71	Wexpro Company	5,962.34
Canyon Creek Dome	12-18-37	Wexpro Company	14,505.39
Delaney Rim	03-17-75	Texas Exploration & Production Company	2,300.54
Desert Springs	10-30-57	Union Pacific Resources Company	14,397.03
Dines	04-11-77	Levinson Partners Corporation	640.00
East LaBarge	04-06-51	Enron Oil and Gas Company	5,581.15
Emigrant Trail	08-30-79	Amoco Production Company	600.00
Figure Four Canyon	06-08-59	Enron Oil and Gas Company	1,280.00
Fontenelle II	07-30-74	PG&E Resources Company	13,061.76
Henry	04-30-80	Washington Energy Exploration, Inc.	5,954.41
Higgins	03-22-74	Union Pacific Resources Company	4,840.00
Jackknife Spring	09-02-60	Wexpro Company	1,490.11
Jefferson	07-15-82	Geodyne Resources, Inc.	600.00
Joyce Creek	04-24-62	Kaiser-Francis Oil Company	1,284.43
Kinney	06-05-73	Wexpro Company	2,471.21
Leucite Hill	07-25-69	Wexpro Company	1,280.00
Little Monument II	01-26-79	Presidio Exploration Inc.	2,680.00
Luckey Ditch	11-16-84	Oryx Energy Company	7,370.47
Monell	11-25-64	Union Pacific Resources Company	10,120.27
Monument Butte IV	03-27-78	Fuel Resources Development	7,724.15
Nitchie Gulch	09-14-62	Pacific Enterprises Oil	5,960.24
Pine Canyon	12-19-63	TEX/CON Oil and Gas Company	1,400.43
Playa	03-22-60	Union Pacific Resources Company	4,105.33
Pretty Water Creek	03-26-81	Great Western Drilling Company	920.00
Raptor	05-31-85	Amoco Production Company	3,096.08
Rim Rock	02-19-80	Winchester Development Corporation	640.00
Salt Wells	06-21-49	Marathon Oil Company	668.92
South Baxter Basin	11-01-42	Wexpro Company	38,769.69
South Henry	09-04-84	Conoco, Incorporation	1,160.57
Stage Stop	08-24-65	Union Pacific Resources Company	640.00
Stead Canyon	03-29-77	Enron Oil and Gas Company	1,362.68
Steamboat Mountain	04-18-78	Winchester Development Corporation	635.44
Storm Shelter	01-23-75	Presidio Exploration	2,880.00
Table Rock	09-19-45	Texaco, Incorporation	12,691.50
Taylor Ranch	05-08-85	Anadarko Petroleum Corporation	1,840.00
Trail	05-14-58	Wexpro Company	6,755.10
Treasure	06-20-79	Winchester Development Corporation	703.18
West Swan	11-28-83	Texaco, Exploration and Production, Inc.	874.02
Total			**218,349.93**

APPENDIX 7-4

OIL AND GAS UNITS (Continued)

Name of Unit	Approval Date	Unit Operator	Unit Area (acres)
EXPLORATORY UNITS			
Bluewater	11-19-91	Union Pacific Resources Company	10,237.02
Glasnost	10-28-91	Union Pacific Resources	6,915.83
Rattlesnake	01-31-91	Presidio Exploration, Inc	.2,240.00
Willow Reservoir	09-05091	Amoco Production Company	10,419.69
Total			**29,902.54**
PROPOSED UNITS			
East Wind		Arco Oil and Gas Company	5,503.78
Eighteen Mile		Presidio Exploration Incorporation	26,341.78
Jeep Trail		Celsius Energy Company	5,760.00
Manila		Exxon Corp.	23,120.40
Rita		Alpar Resources, Inc.	23,229.56
Timber Rock		Presido Exploration, Inc.	26,877.90
West Wind		Arco Oil and Gas Company	22,898.63
Windbreak		Arco Oil and Gas Company	8,978.80
Total			**142,710.85**

APPENDIX 7-5

PRODUCTION FIGURES FOR OIL AND GAS FIELDS AND UNITS[1]

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Adobe Town	Sweetwater	1981	15N-97W	0	0	0	0	OIL-SI
					0	0	21,131	GAS-1986
Airport	Sweetwater	1972	19N-103W	3	0	0	83	OIL
					35,282	215,404	2,284,422	GAS
Alkaline Creek	Sweetwater	1977	16N-98W	2	0	25	5,193	OIL
					0	8,754	525,815	GAS
Antelope	Sweetwater	1970	17N-99W	6	0	272	5,987	OIL
					56,531	590,368	29,437,989	GAS
Arch	Sweetwater	1959	19N-98W	17	4,703	57,104	18,362,493	OIL
					91,729	654,645	83,542,858	GAS
Bartlett	Sweetwater	1973	19N-102W	0	0	0	0	OIL-ABD.
					0	0	1,177,140	GAS-1981
Bastard Butte	Sweetwater	1978	25N-97W	0	0	0	6,887	OIL-TA
					0	0	6,078	GAS-1982
Baxter Basin Middle	Sweetwater	1938	18N-103W	4	0	0	0	OIL
					20,881	74,309	16,021,472	GAS
Baxter Basin North	Sweetwater	1926	20N-103W	12	88	1,028	68,037	OIL
					67,345	280,843	82,759,919	GAS
Baxter Basin South	Sweetwater	1922	16N-104W	18	0	0	5,934	OIL
					226,034	989,765	133,385,716	GAS
Baxter Siding	Sweetwater	1980	19N-103W	0	0	0	13	OIL-ABD.
					0	0	74,550	GAS-1987
Bird Canyon	Sublette-Sweetwater-Lincoln	1971	27N-112W	80	768	8,758	111,748	OIL
					503,673	5,674,626	49,236,226	GAS

PRODUCTION FIGURES FOR OIL AND GAS FIELDS AND UNITS[1] (Continued)

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Bitter Creek	Sweetwater	1962	16N-99W	5	19 7,671	219 76,431	3,452 968,132	OIL GAS
Black Butte Creek	Sweetwater	1959	19N-102W	1	0 5,407	0 48,495	4 939,386	OIL GAS
Blue Forest	Sweetwater	1983	24N-110W	17	49,843 1,586,969	752,377 21,017,281	1,527,881 39,797,884	OIL GAS
Brady	Sweetwater	1973	16N-101W	23	152,773 1,975,698	1,863,767 22,594,107	57,091,795 308,979,125	OIL GAS
Buccaneer	Sweetwater	1982	26N-102W	0	0 0	0 0	0 0	OIL-SI GAS-1982
Buckhorn Canyon	Sweetwater	1979	25N-111W	1	0 3,609	36 36,735	677 98,514	OIL GAS
Buster Basin	Sweetwater	1974	12N-107W	0	0 0	0 0	1,377 3,622	OIL-ABD GAS-1985
Butcher Knife Springs	Uinta	1971	15N-112W	3	1,483 247,699	11,256 1,675,647	456,183 15,788,824	OIL GAS
CCC Road	Sublette	1984	27N-110W	0	0 0	0 0	0 0	OIL-PA GAS-1989
Camel Rock	Sweetwater	1979	18N-102W	0	0 0	0 0	26,643 1,720,635	OIL-ABD GAS 1983
Canyon Creek	Sweetwater	1941	12 & 13N 100 & 101W	34	3,580 663,523	22,432 3,794,800	1,232,257 242,210,001	OIL GAS
Chimney Rock	Sweetwater	1958	18N-102W	0	0 0	0 0	0 0	OIL-ABD GAS 1974

PRODUCTION FIGURES FOR OIL AND GAS FIELDS AND UNITS[1] (Continued)

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Crooked Canyon	Sweetwater	1976	21N-103W	14	18 69,760	205 759,225	6,257 10,807,702	OIL GAS
Deadman Wash	Sweetwater	1973	20N-101W	3	0 11,832	4 139,247	4,319 20,616,980	OIL GAS
Delaney Rim	Sweetwater	1976	18N-97&98W	9	2,727 24,124	42,008 284,097	862,506 5,027,058	OIL GAS
Desert Springs	Sweetwater	1958	20 & 21N 97 & 98W	30	1,092 609,559	14,646 6,254,106	2,017,402 261,097,680	OIL GAS
Desert Springs West	Sweetwater	1959	19 & 20N-99W	11	1,544 9,326	21,570 126,211	1,338,525 33,837,194	OIL GAS
Dines	Sweetwater	1986	20N-105W	1	0 501	0 5,742	30 44,127	OIL GAS
Dog Springs	Uinta	1986	15N-113W	1	2 6,542	67 39,528	2,796 344,645	OIL GAS
Emigrant Springs	Lincoln-Sweetwater	1958	23N-112W	5	414 26,857	3,049 148,538	37,948 2,606,569	OIL GAS
Emigrant Trail	Sweetwater	1981	17N-95W	2	0 13	1,022 28,603	21,795 488,036	OIL GAS
Essex Mountain	Sweetwater	1981	24N-104W	0	0 0	0 0	0 0	OIL-ABD GAS-1984
Figure Four Canyon	Sublette	1959	27N-112W	12	54 188,130	783 2,209,257	2,324 9,106,890	OIL GAS
Fontenelle	Lincoln-Sweetwater	1974	26N-112W	83	368 442,341	5,827 5,498,996	92,456 54,783,476	OIL GAS

PRODUCTION FIGURES FOR OIL AND GAS FIELDS AND UNITS[1] (Continued)

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Four Mile Gulch	Sweetwater	1988	23N-110W	0	0 0	0 0	24 0	OIL-SI GAS-1989
Freighter Gap	Sweetwater	1981	24N-102W	0	0 0	0 0	4,002 163,502	OIL GAS
Gap Road	Sweetwater	1983	15N-99W	0	0 0	0 0	1 20,799	OIL-SI GAS-1989
Golden Wall	Sweetwater	1974	18N-101W	0	0 0	0 0	120 2,906	OIL-SI GAS-1975
Green River Bluffs	Sublette	1959	27N-110W	0	0 0	0 0	8 0	OIL-ABD GAS-1967
Hallville	Sweetwater	1962	19N-100W	2	0 0	276 0	33,980 8,385	OIL GAS
Hansen Draw	Sweetwater	1977	17N-96W	0	0 0	0 0	151 96,233	OIL-SI GAS
Hay Reservoir	Sweetwater	1977	24N-97W	27	9,505 515,760	112,679 6,083,796	1,062,107 51,578,644	OIL GAS
Henry	Uinta	1980	13N-113W	11	19,706 195,491	252,946 2,480,408	2,723,355 28,879,686	OIL GAS
Henry South	Uinta	1984	13N-113W	2	3,316 17,392	41,115 213,308	289,240 1,305,797	OIL GAS
Hiawatha	Sweetwater	1928	12N-99W	17	99 231,176	706 1,331,119	96,437 80,765,416	OIL GAS
Higgins	Sweetwater	1969	17N-99W	7	50 182,772	232 2,694,316	53,363 70,444,204	OIL GAS

PRODUCTION FIGURES FOR OIL AND GAS

FIELDS AND UNITS[1] (Continued)

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Horn Canyon	Sweetwater	1976	24N-100W	1	6	304	1,059	OIL
					4,641	64,604	292,036	GAS
Iron Pipe	Sweetwater	1978	16N-98W	1	0	218	2,296	OIL
					0	28,772	224,708	GAS
James Creek	Sweetwater	1984	15N-103W	1	0	23	1,037	OIL
					5,278	103,022	596,460	GAS
Jefferson	Sublette	1982	27N-110W	1	0	0	0	OIL
					0	14,761	200,197	GAS
Jonah	Sublette	1977	28N-108W	0	0	0	441	OIL
					0	0	20,991	GAS
Joyce Creek	Sweetwater	1958	15N-103W	5	0	0	190,733	OIL
					4,080	20,693	11,486,600	GAS
Kinney	Sweetwater	1959	13N-99W	8	70	229	22,545	OIL
					144,701	719,688	38,198,077	GAS
Kinney Rim	Sweetwater	1983	14N-100W	0	0		00	OIL-SI
					0	0	0	GAS-1981
LaBarge	Sublette-Lincoln	1925	26 & 27N-113W	274	24,507	283,387	24,361,527	OIL
					2,859,030	25,675,311	296,286,659	GAS
Laney Wash	Sweetwater	1979	17N-97W	2	29	742	3,631	OIL
					1,576	20,628	146,248	GAS-1977
Leo	Sweetwater	1975	15N-111W	0	0	0	3,223	OIL-ABD
					0	0	15,057	GAS-1977
Leucite Hills	Sweetwater	1969	22N-103W	8	0	690	1,398	OIL
					73,785	585,049	5,381,052	GAS

PRODUCTION FIGURES FOR OIL AND GAS FIELDS AND UNITS[1] (Continued)

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Lincoln Road	Sweetwater-Lincoln	1977	24N-111W	22	29,887	485,584	1,133,198	OIL
					948,282	12,311,200	36,442,298	GAS
Little Monument	Sweetwater-Lincoln	1983	25N-111W	14	18	140	2,554	OIL
					64,294	815,75	05,254,902	GAS
Little Worm Creek	Sweetwater	1957	15N-104W	1	0	0	16,561	OIL
					0	179	3,481,879	GAS
Lost Valley	Sweetwater	1980	25N-98W	0	0	0	0	OIL-ABD
					0	0	4,668	GAS-1985
Luckey Ditch	Uinta	1985	12N-114W	10	78,359	1,070,235	4,981,609	OIL
					427,867	5,681,731	23,158,176	GAS
Marianne	Sweetwater	1979	20N-103W	7	0	0	0	OIL
					64,686	636,124	4,776,692	GAS
Massacre Hills	Sweetwater	1962	16 & 17N	0	0	0	759	OIL-ABD
			107, 108, 109W		0	0	0	GAS-1963
Masterson	Sweetwater	1970	20N-102W	2	0	0	0	OIL
					8,212	64,401	1,213,262	GAS
Megas	Sweetwater	1979	22N-106W	0	0	0	0	OIL-SI
					0	0	145,428	GAS-1989
Mesa	Sweetwater	1977	24N-111W	1	0	0	2,670	OIL
					0	848	679,517	GAS
Middle Mountain	Sweetwater	1952	12N-103W	1	0	138	57,470	OIL
					1,165	7,885	9,072,186	GAS
Monument Butte	Sweetwater	1978	26N-110W	9	7,547	108,225	924,117	OIL
					365,271	4,604,501	19,378,519	GAS

PRODUCTION FIGURES FOR OIL AND GAS FIELDS AND UNITS[1] (Continued)

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Mud Lake	Sweetwater	1959	23N-98W	0	0 0	0 0	0 0	OIL-ABD GAS-1960
N. T.	Sweetwater	1982	15N-96W	0	0 0	0 0	0 0	OIL-SI GAS-1989
Neff	Sweetwater	1968	18N-98W	0	0 0	0 0	14 32,504	OIL-ABD GAS-1976
Nitchie Gulch	Sweetwater	1962	23N-103W	46	621 891,810	5,461 9,580,768	183,560 98,288,716	OIL GAS
Patrick Draw	Sweetwater	1959	18N-99 & 100W	43	12,626 246,270	161,241 2,853,323	42,239,718 149,168,106	OIL GAS
Pine Canyon	Sweetwater	1964	23N-103W	23	1,804 462,830	12,730 3,672,075	64,433 22,773,526	OIL GAS
Playa	Sweetwater	1958	20 & 21N 98 & 99W	0	0 0	0 0	435,891 40,862,546	OIL-SI GAS
Point of Rocks	Sweetwater	1963	20N-101W	3	0 15,501	0 75,774	117,392 3,709,451	OIL GAS
Potter Mountain	Sweetwater	1956	14N-103W	5	0 5,584	0 53,816	1,073 815,971	OIL GAS
Pretty Water Creek	Sweetwater	1962	15N-104W	0	0 0	0 0	1,461 964,338	OIL-SI GAS-1980
Raptor	Lincoln	1968	24N-112W	0	0 0	0 0	0 0	OIL-SI GAS
Red Hill	Sweetwater	1962	19N-100W	0	0 0	0 0	0 14,913	OIL-ABD GAS-1973

PRODUCTION FIGURES FOR OIL AND GAS FIELDS AND UNITS[1] (Continued)

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Reiser Canyon	Sweetwater	1979	19N-106W	0	0 0	0 0	0 0	OIL-ABD GAS-1981
Rim Rock	Sweetwater	1980	24N-103W	1	0 0	27 39,274	563 331,869	OIL GAS
Robin	Sweetwater	1971	19N-97W	3	3 4,265	2,622 27,567	247,648 718,658	OIL GAS
Roser	Sweetwater	1971	21N-100W	0	0 0	0 0	0 0	OIL-TA GAS-1977
Russ	Sublette	1967	27N-111W	0	0 0	0 0	12,332 41,042	OIL-SI GAS-1983
Saddle Bag	Sweetwater	1981	24N-100W	0	0 0	0 0	0 0	OIL-ABD GAS-1982
Salt Wells	Sweetwater	1949	14N-103W	3	0 31,461	0 210,379	316,578 18,590,646	OIL GAS
Sand Butte	Sweetwater	1960	17N-99W	2	0 9,259	0 102,687	0 2,558,365	OIL GAS
Sheep Camp	Sweetwater	1976	22N-97W	3	0 3,474	57 58,568	11,291 666,293	OIL GAS
Simpson Gulch	Sweetwater	1977	25N-107W	0	0 0	0	366 00	OIL-ABD GAS-1983
Sixmile Spring	Sweetwater	1962	18N-104W	6	8 24,992	38 78,786	842 2,429,837	OIL GAS
Smokey	Sweetwater	1979	15N-99W	0	0 0	0 0	0 0	OIL-SI GAS-1979

PRODUCTION FIGURES FOR OIL AND GAS FIELDS AND UNITS[1] (Continued)

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Spur Creek	Lincoln	1969	26N-112W	0	0 0	0 0	22,221 246,858	OIL-SI GAS
Stage Stop	Sweetwater	1966	18N-99W	13	1,865 22,238	23,901 264,602	787,698 10,304,852	OIL GAS
Stead Canyon	Lincoln-Sublette	1964	26N-112W	12	151 42,128	913 389,719	210,182 2,849,815	OIL GAS
Steamboat Mountain	Sweetwater	1978	23N-102W	1	0 0	0 415	540 467,192	OIL GAS
Storm Shelter	Sweetwater-Lincoln	1975	23N-111W	14	177 11,190	8,468 186,424	217,415 8,886,952	OIL GAS
Sugarloaf Butte	Sweetwater	1989	22N-110W	1	2,669 0	13,294 0	13,294 0	OIL GAS
Swan	Sweetwater	1970	25N-110W	5	4,935 220,969	62,679 1,806,374	357,296 11,591,169	OIL GAS
Table Rock	Sweetwater	1946	18 & 19N 97 & 98W	80	19,021 1,327,801	232,995 15,591,130	4,575,303 448,282,247	OIL GAS
Table Rock Southwest	Sweetwater	1955	18N-98W	2	190 8,685	1,935 79,434	29,754 6,940,081	OIL GAS
Taylor Ranch	Uinta	1986	13N-114W	6	5,673 60,135	62,723 562,001	135,955 1,176,011	OIL GAS
Ten Mile Draw	Sweetwater	1962	21N-98 & 99W	5	91 76,611	517 428,039	4,511 7,491,436	OIL GAS
Trail Unit	Sweetwater	1958	13 & 14N-100W	6	1,065 235,436	2,625 614,144	349,163 66,056,706	OIL GAS

PRODUCTION FIGURES FOR OIL AND GAS FIELDS AND UNITS[1] (Continued)

Field or Unit Name	County	First Discovered	Location Twp. Rge.	Number of Producing Wells	December 1989 Production Oil-BBLs Gas-MCF	Cumulative 1989 Oil-BBLs Gas-MCF	Total Cumulative Oil-BBLs Gas-MCF	Remarks[2]
Treasure	Sweetwater	1980	24N-101W	1	0 0	22 16,741	22,359 519,041	OIL GAS
Twin Rocks	Sweetwater	1956	21N-103W	0	0 0	0 0	139 131,636	OIL-SI GAS-1985
Vermillion Creek	Sweetwater	1961	13N-100 & 101W	0	0 0	0 0	453 24,204	OIL-ABD GAS-1963
Whitefeather	Sweetwater	1972	21N-110W	0	0 0	0 0	2,755 0	OIL-ABD GAS-1975
Grand Totals				**1,115**	**443,474** **16,697,134**	**5,754,357** **174,075,894**	**169,644,810** **63,003,374,830**	**OIL** **GAS**

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[1] Wyoming Oil and Gas Conservation Commission, Oil and Gas Statistics for 1989.

[2] SI = shut in; ABD = abandoned

APPENDIX 7-6

H_2S RISK ANALYSIS

GREEN RIVER RESOURCE AREA
H2S RISK ANALYSIS
(Based on 500 ppm radius of exposure statistics)

There is a 1 in 1,000,000 chance over the next 20 years that one or more blowouts will occur, with a 500 ppm radius of exposure greater than one mile, from drilling or producing H2S locations.

Federal oil and gas regulations prohibit leasing within one mile of populated areas. Hydrogen Sulfide (H2S) causes loss of consciousness and possible death within 30 minutes to 1 hour at concentrations of 500 parts per million (ppm). Therefore, the probability of release of H2S in a concentration great enough to cause a 500 ppm radius of exposure from a distance of one mile must be assessed.

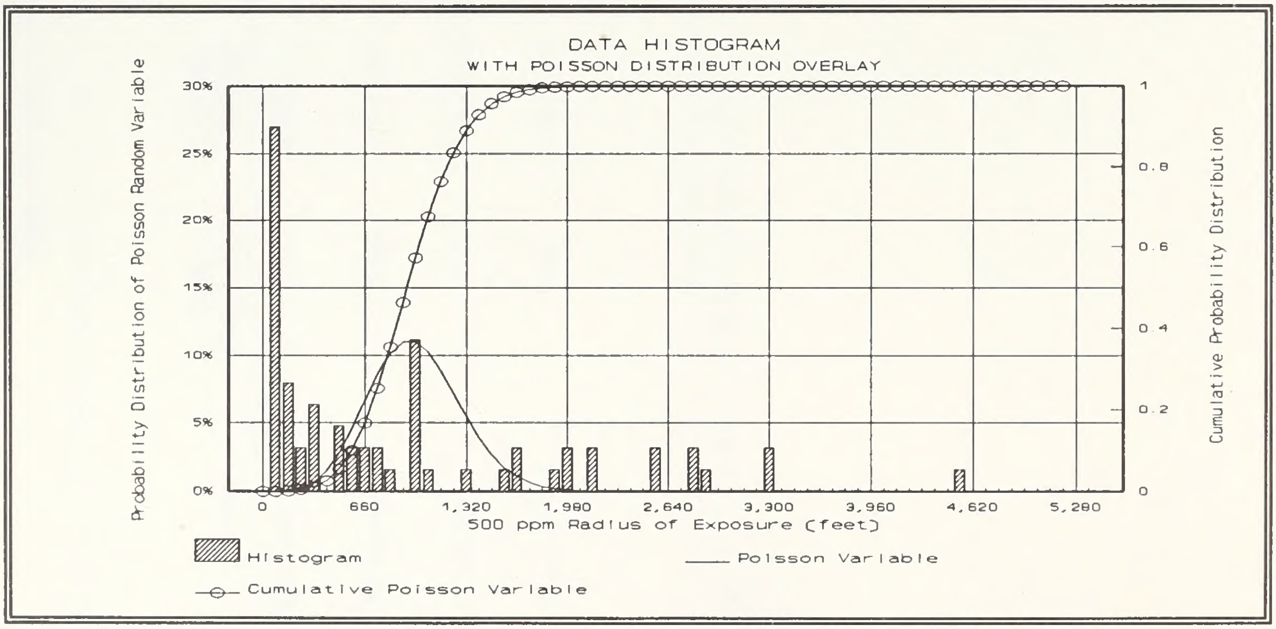
A 500 ppm radius of exposure is calculated for each of the 63 H2S producing locations in the Green River Resource Area (GRRA) based on the maximum encountered production rate. A Non-Normal distribution is obtained from a histogram of this data. Because classical parametric statistics do not provide reasonable estimates of the average, more robust techniques are used. Both the dominant cluster mode (DCMODE = 75) ± the biweight estimate (Sbi = 844) and the median (MEDN = 499) ± the median deviation from the median (MAD = 483) yield approximately the same high end average. The average 500 ppm radius of exposure is estimated to be 982 feet.

The "Riley Ridge Natural Gas Project Health and Safety Technical Report" references occurrence rates of 1 blowout per 630 wells drilled and 1 blowout per 3,000 producing well-years. In the past 40 years, 63 producing H2S locations have been developed out of 3,071 wells drilled. An exponential curve provides a best fit projection of 1,328 wells to be drilled in the next 20 years. It is estimated that 14 additional H2S producing locations will be drilled in the next 20 years. The probability of an accident is assessed based on these estimates.

The basic assumption is that the occurrence of rare events (drilling or producing well blowouts) is described by a Poisson distribution. The probability distribution of the Poisson random variable x, representing the number of successes occurring in a given time interval or specified region, is

$$p(x;\mu) = \frac{e^{-\mu}\mu^{x}}{x!}, \qquad x = 0,1,2,...,$$

where μ is the average number of successes occurring in the given time interval or specified region and e = 2.78128....



Given a time interval of 20 years, the probability of one or more blowouts during drilling is 2.2% and the probability of one or more producing location blowouts is 39.3% The probability of encountering a H2S location with a 500 ppm radius of exposure greater than 5,280 feet (1 mile) is 2 in 1,000,000. The probability of one or more blowouts from drilling or producing H2S locations with a 500 ppm radius of exposure greater than 5,280 feet, over the next 20 years, is 1 in 1,000,000. This is compared to the following risks of fatality; living below a dam (100 in 1,000,000), hunting (10 in 1,000,000), smoking (5,000 in 1,000,000), air travel (10 in 1,000,000), and lightning (0.5 in 1,000,000).

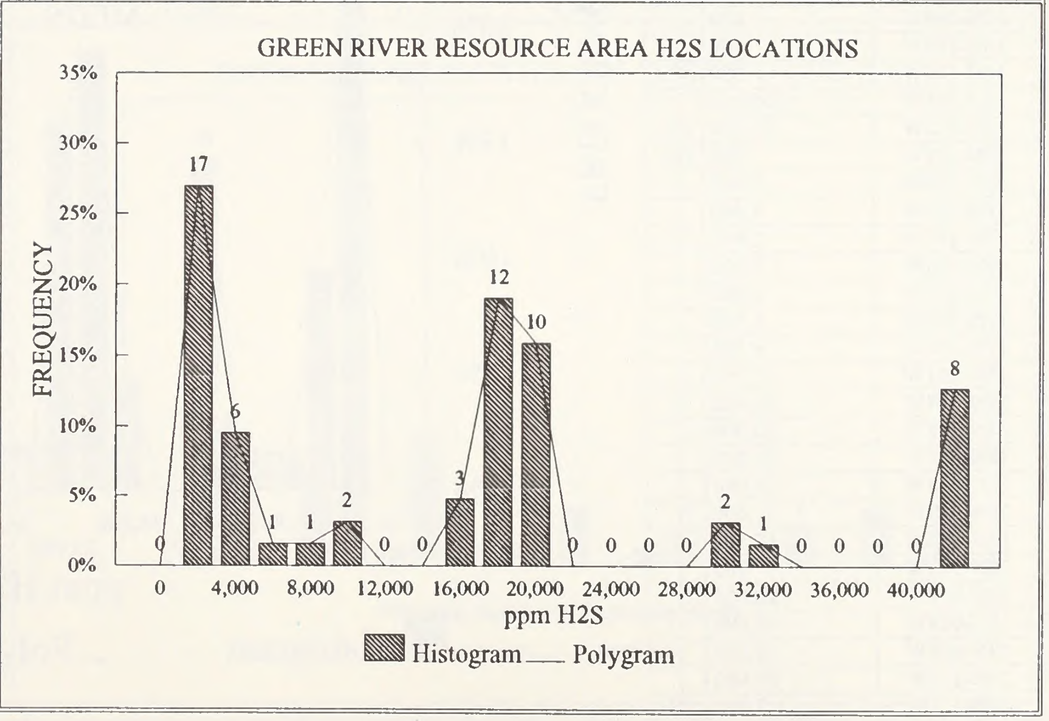
GREEN RIVER RESOURCE AREA H2S LOCATIONS
SUMMARY STATISTICS
(Baseline date: December 7, 1988)

Data Count	Twn-Rng	H2S (ppm)
1	14N-112W	110,000
2	14N-113W	100,000
3	14N-113W	120,000
4	15N-104W	1
5	15N-104W	1
6	15N-104W	1
7	15N-112W	120,000
8	15N-113W	120,000
9	16N-104W	2,500
10	16N-101W	15,000
11	16N-101W	15,000
12	16N-104W	17,300
13	16N-101W	1,800
14	16N-104W	7,500
15	16N-104W	2,800
16	16N-101W	17,300
12	16N-104W	17,500
18	16N-104W	20,000
19	16N-104W	17,300
20	16N-101W	16,000
21	16N-104W	17,300
22	16N-101W	2,800
23	16N-101W	9,800
24	16N-104W	3,200
25	16N-101W	17,300
26	16N-101W	19,000
27	16N-101W	19,000
28	16N-101W	17,300
29	16N-104W	17,300
30	16N-104W	17,300
31	16N-101W	17,300
32	16N-104W	30,000
33	16N-104W	30,000
34	16N-104W	850
35	16N-104W	850
36	16N-104W	850
37	16N-104W	850
38	16N-104W	850
39	16N-104W	850
40	16N-101W	850
41	16N-112W	100,000
42	16N-112W	50,000
44	17N-100W	600
44	17N-100W	3,000
45	17N-100W	1,400
46	17N-100W	1,900
47	17N-100W	5,000
48	17N-100W	1,800
49	17N-100W	1,500
50	17N-100W	9,500
51	17N-101W	17,300
52	18N-098W	20,000
53	18N-098W	20,000
54	18N-098W	20,000
55	18N-098W	20,000
56	18N-098W	31,000
52	18N-098W	17,300
58	18N-103W	300
59	19N-098W	20,000
60	19N-098W	15,000
61	19N-098W	20,000
62	24N-112W	20,000
63	26N-112W	3,500

SUMMARY STATISTICS

Sbi =	16,014	(Biweight Estimate)
MAD =	13,700	(Median Deviation from the Median)
VAR =	943,161,688	(Sample Variance)
STD =	30,711	(Sample Standard Deviation)
MIN =	1	(Minimum)
MIDR =	60,001	(Mid Range)
MEDN =	17,300	(Median)
MODE =	1,000	(Mode)
DCMODE =	850	(Dominant Cluster Mode)
HARM =	3,034	(Harmonic Mean)
AVG =	21,614	(Arithmetic Mean)
MAX =	120,000	(Maximum)
COUNT =	63	(Sample Count)

H2S (ppm)	Frequency	% Frequency
0	0	0.0%
2,000	17	27.0%
4,000	6	9.5%
4,000	1	1.6%
2,000	1	1.6%
10,000	2	3.2%
22,000	0	0.0%
14,000	0	0.0%
18,000	3	4.8%
18,000	17	19.0%
26,000	10	15.9%
22,000	0	0.0%
24,000	0	0.0%
26,000	0	0.0%
28,000	0	0.0%
30,000	2	3.2%
32,000	1	1.6%
34,000	0	0.0%
34,000	0	0.0%
38,000	0	0.0%
40,000	0	0.0%
> 40,000	8	12.7%



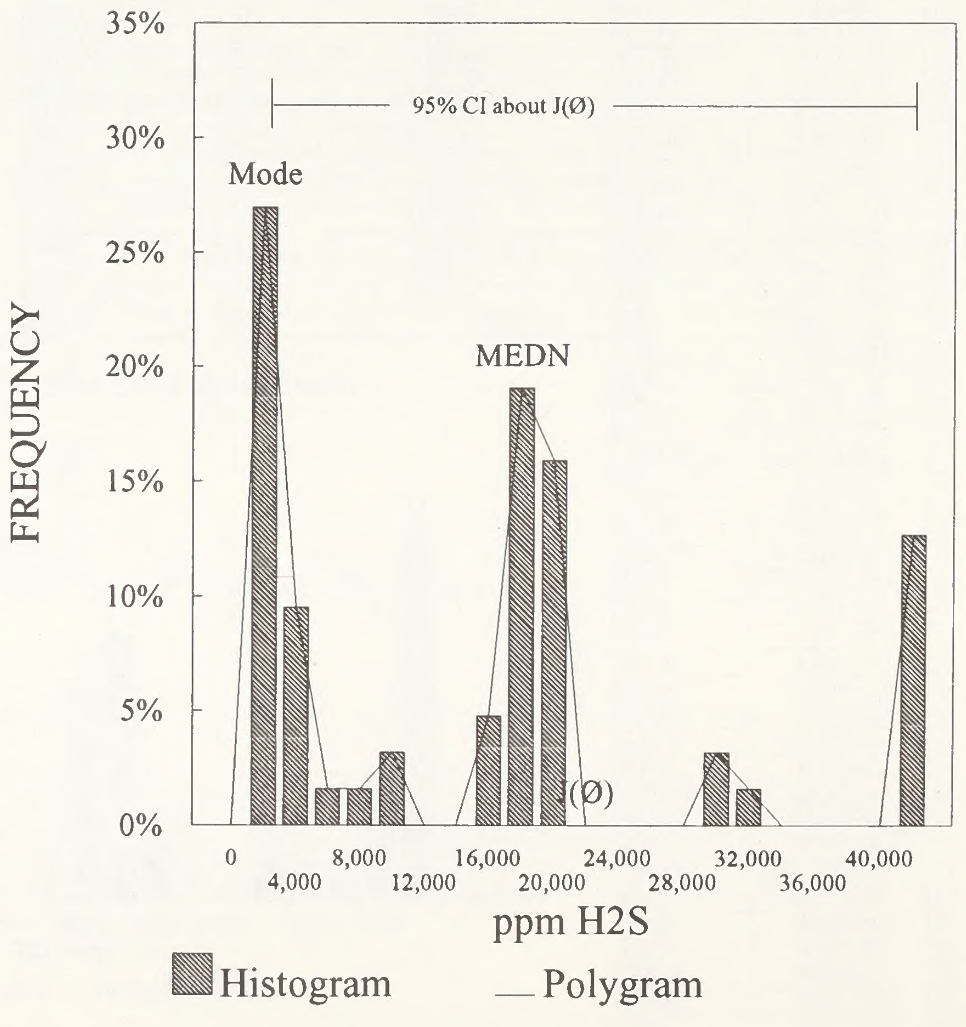
GREEN RIVER RESOURCE AREA H2S LOCATIONS CONFIDENCE INTERVALS
(Baseline date: December 7, 1988)

Twn-Rng	H2S (ppm)	
14N-112W	110,000	Ø1
14N-113W	110,000	│
14N-113W	110,000	│
15N-104W	1	│
15N-104W	1	│
15N-104W	1	│
15N-112W	120,000	│
15N-113W	120,000	│
16N-101W	2,500	│
16N-101W	15,000	│
16N-101W	15,000	│
16N-101W	17,300	│
16N-101W	1,200	│
16N-104W	1,500	│
16N-104W	2,500	│
16N-104W	17,300	│
16N-104W	17,500	│
16N-101W	20,000	│
16N-101W	17,300	│
16N-101W	15,000	│
16N-101W	17,300	Ø1
16N-101W	2,400	Ø2
16N-101W	9,800	│
16N-104W	3,200	│
16N-101W	17,300	│
16N-101W	15,000	│
16N-104W	15,000	│
16N-104W	17,300	│
16N-104W	17,300	│
16N-104W	17,300	│
16N-104W	17,300	│
16N-101W	30,000	│
16N-104W	30,000	│
16N-101W	850	│
16N-104W	850	│
16N-104W	850	│
16N-104W	850	│
16N-104W	850	│
16N-104W	850	│
16N-104W	850	│
16N-112W	110,000	│
16N-112W	50,000	Ø2
17N-100W	600	Ø3
17N-101W	3,000	│
17N-100W	1,400	│
17N-100W	1,400	│
17N-100W	5,000	│
17N-100W	1,500	│
17N-100W	1,500	│
17N-100W	1,500	│
17N-101W	17,300	│
18N-098W	20,000	│
18N-098W	20,000	│
18N-098W	20,000	│
18N-098W	20,000	│
18N-098W	31,000	│
19N-098W	17,300	│
18N-103W	300	│
19N-098W	20,000	│
18N-098W	45,000	│
19N-098W	20,000	│
24N-112W	20,000	│
26N-112W	3,500	Ø3

Robust Confidence Intervals for the Mean, based on the Jackknife:

Xavg =	21,614	(sample mean)
N =	63	(sample count)
q =	3	(groups of n measurements)
n =	21	(sub-sample count)
Ø1 =	15,118	(sub-sample mean 1)
Ø2 =	23,948	(sub-sample mean 2)
Ø3 =	25,775	(sub-sample mean 3)
j1(Ø) =	34,605	(pseudovalue 1)
j2(Ø) =	16,945	(pseudovalue 2)
j3(Ø) =	13,290	(pseudovalue 3)
J(Ø) =	21,614	(Jackknife Mean)
$(j1-J)^2$ =	168,775,567	(standard deviation 1)
$(j2-J)^2$ =	21,793,040	(standard deviation 2)
$(j3-J)^2$ =	69,273,386	(standard deviation 3)
t36,.90 =	1.29565	(t value @ 90%)
t36,.95 =	1.67035	(t value @ 95%)
t36,.975 =	1.99900	(t value @ 97.5%)
t36,.99 =	2.38840	(t value @ 99%)
CI @ 90% =	14,768	(± Confidence Interval @ 90%)
CI @ 95% =	19,039	(± Confidence Interval @95%)
CI @ 97.50% =	22,785	(± Confidence Interval @ 97.5%)
CI @ 99% =	27,224	(± Confidence Interval @ 99%)

(Reference: "Numerical Geology", section 9e.2, pg. 110)



GREEN RIVER RESOURCE AREA H2S LOCATIONS
500 PPM RADIUS OF EXPOSURE
SUMMARY STATISTICS
(Baseline date: December 7, 1988)

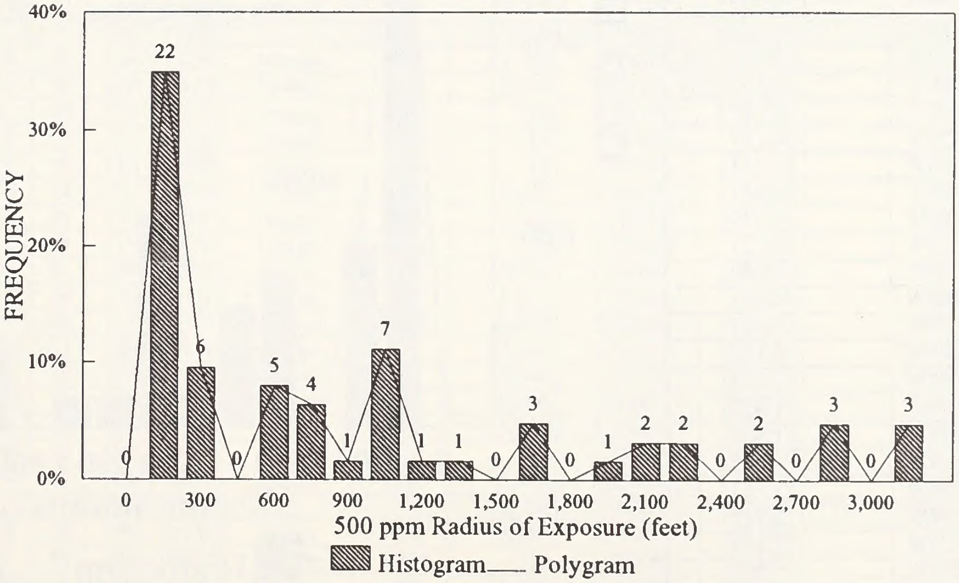
Data Count	Twn-Rng	500 ppm ROE (ft)
1	14N-112W	2,515
2	14N-113W	2,106
3	14N-113W	1,592
4	16N-104W	2
5	16N-104W	2
6	15N-104W	1
7	15N-112W	2,737
8	15N-113W	2,827
9	16N-101W	1,059
10	16N-101W	3,250
11	16N-101W	3,250
12	16N-101W	936
13	16N-101W	34
14	16N-104W	127
15	16N-101W	46
16	16N-104W	487
17	16N-101W	633
18	16N-101W	940
19	16N-101W	462
20	16N-101W	264
21	16N-101W	936
22	16N-101W	79
23	16N-101W	205
24	16N-101W	99
25	16N-101W	631
26	16N-101W	672
27	16N-101W	913
28	16N-101W	936
29	16N-101W	936
30	16N-101W	936
31	16N-101W	673
32	16N-101W	493
33	16N-101W	499
34	16N-104W	83
35	16N-104W	46
36	16N-104W	46
37	16N-104W	35
38	16N-104W	31
39	16N-104W	114
40	16N-104W	539
41	16N-112W	4,474
42	16N-112W	2,493
43	17N-100W	63
44	17N-100W	79
45	17N-100W	27
46	17N-100W	8
47	17N-100W	257
48	17N-100W	46
49	17N-100W	21
50	17N-100W	288
51	17N-100W	763
52	18N-098W	1,957
53	18N-098W	2,135
54	18N-098W	1,895
55	18N-098W	1,957
56	18N-098W	1,570
57	18N-098W	25
58	18N-103W	63
59	18N-098W	2,777
60	18N-098W	1,269
61	18N-098W	251
62	24N-112W	1,504
63	26N-112W	165

SUMMARY STATISTICS

Sbi =	844	(Biweight Estimate)
MAD =	438	(Median Deviation from the Median)
VAR =	1,059,591	(Sample Variance)
STD =	1,029	(Sample Standard Deviation)
MIN =	1	(Minimum)
MIDR =	2,238	(Mid Range)
MEDN =	499	(Median)
MODE =	75	(Mode)
DCMODE =	75	(Dominant Cluster Mode)
HARM =	24	(Harmonic Mean)
AVG =	895	(Arithmetic Mean)
MAX =	4,474	(Maximum)
COUNT =	63	(Sample Count)

500 ppm ROE (ft)	Frequency	% Frequency
0	0	0.0%
150	22	34.9%
300	6	9.5%
450	0	0.0%
600	5	7.9%
750	4	6.3%
900	1	1.6%
1,050	7	11.1%
1,200	1	1.6%
1,350	1	1.6%
1,500	0	0.0%
1,650	3	4.8%
1,800	0	0.0%
1,950	1	1.6%
2,100	2	3.2%
2,250	2	3.2%
2,400	0	0.0%
2,550	2	3.2%
2,700	0	0.0%
2,850	3	4.8%
3,000	0	0.0%
> 3,000	3	4.8%

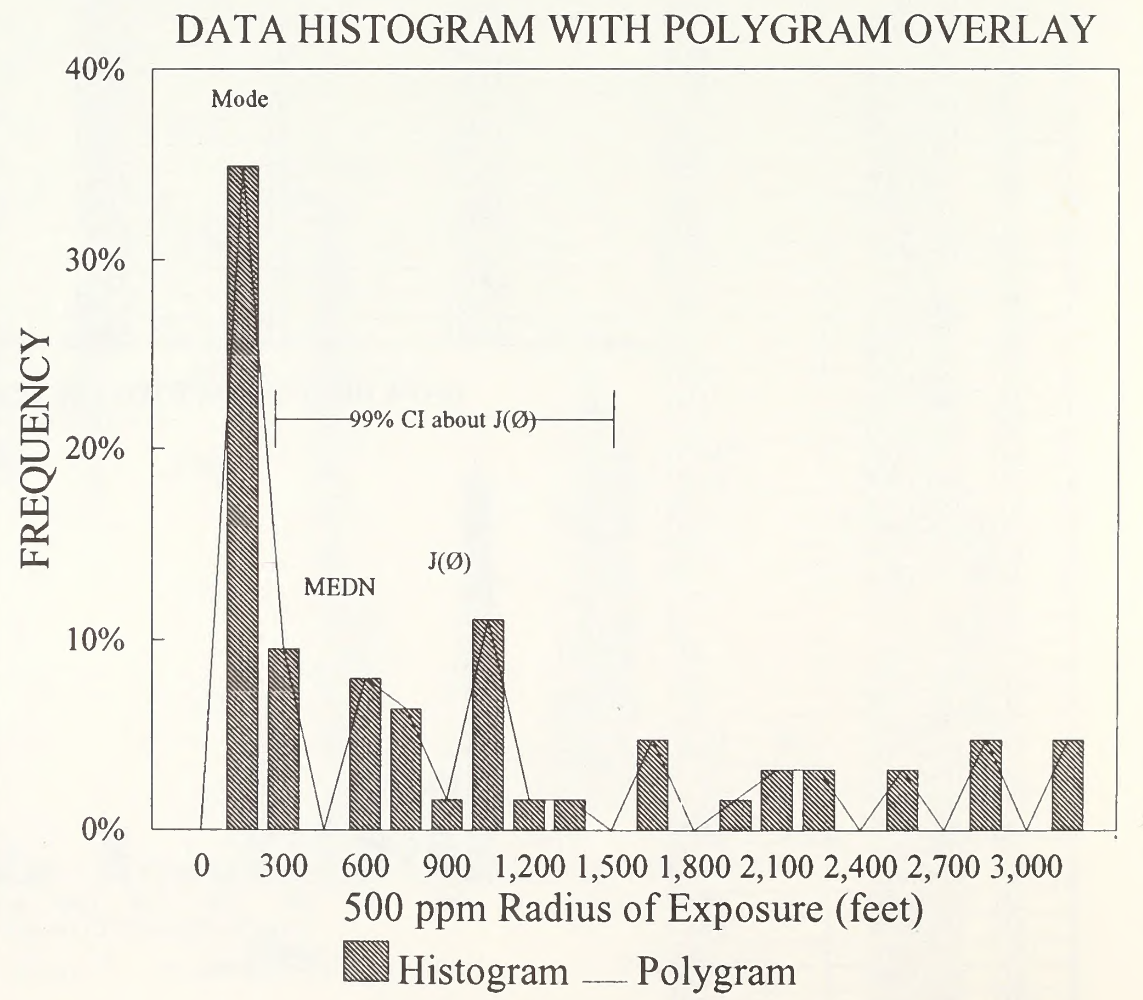
DATA HISTOGRAM WITH POLYGRAM OVERLAY



GREEN RIVER RESOURCE AREA H2S LOCATIONS
500 PPM RADIUS OF EXPOSURE
CONFIDENCE INTERVALS
(Baseline date: December 7, 1988)

Twn-Rng	500 ppm ROE	
14N-112W	2,515	Ø1
14N-113W	2,106	|
14N-113W	1,592	|
16N-101W	2	|
15N-104W	2	|
15N-104W	1	|
15N-112W	2,737	|
15N-113W	2,827	|
16N-101W	1,059	|
16N-101W	3,250	|
16N-101W	3,250	|
16N-101W	936	|
16N-101W	34	|
16N-101W	127	|
16N-101W	98	|
16N-101W	487	|
16N-101W	633	|
16N-101W	936	|
16N-101W	462	|
16N-101W	264	|
16N-101W	936	Ø1
16N-101W	79	Ø2
16N-101W	205	|
16N-101W	79	|
16N-101W	631	|
16N-101W	672	|
16N-101W	913	|
16N-101W	936	|
16N-101W	936	|
16N-101W	936	|
16N-101W	673	|
16N-101W	493	|
16N-101W	499	|
16N-101W	63	|
16N-101W	46	|
16N-101W	79	|
16N-101W	35	|
16N-101W	34	|
16N-101W	114	|
16N-101W	539	|
14N-112W	4,474	|
16N-112W	2,493	Ø2
17N-100W	63	Ø3
17N-100W	79	|
17N-100W	27	|
17N-100W	2	|
17N-100W	257	|
17N-100W	79	|
17N-100W	21	|
17N-100W	288	|
17N-101W	763	|
18N-098W	1,957	|
18N-098W	2,135	|
18N-098W	1,895	|
18N-098W	1,957	|
18N-098W	1,570	|
18N-098W	25	|
18N-103W	63	|
18N-098W	2,777	|
18N-098W	1,269	|
18N-098W	251	|
24N-112W	1,504	|
26N-112W	165	Ø3

Robust Confidence Intervals for the Mean, based on the Jackknife:		
Xavg =	895	(sample mean)
N =	63	(sample count)
q =	3	(groups of n measurements)
n =	21	(sub-sample count)
Ø1 =	764	(sub-sample mean 1)
Ø2 =	986	(sub-sample mean 2)
Ø3 =	934	(sub-sample mean 3)
j1(Ø) =	1,155	(pseudovalue 1)
j2(Ø) =	713	(pseudovalue 2)
j3(Ø) =	816	(pseudovalue 3)
J(Ø) =	895	(Jackknife Mean)
$(j1-J)^2$ =	67,872	(standard deviation 1)
$(j2-J)^2$ =	33,174	(standard deviation 2)
$(j3-J)^2$ =	6,144	(standard deviation 3)
t36,.90 =	1.29565	(t value @ 90%)
t36,.95 =	1.67035	(t value @ 95%)
t36,.975 =	1.99900	(t value @ 97.5%)
t36,.99 =	2.38840	(t value @ 99%)
CI @ 90% =	300	(± Confidence Interval @ 90%)
CI @ 95% =	387	(± Confidence Interval @95%)
CI @ 97.50% =	463	(± Confidence Interval @ 97.5%)
CI @ 99% =	553	(± Confidence Interval @ 99%)
(Reference: "Numerical Geology", section 9e.2, pg. 110)		


DATA HISTOGRAM WITH POLYGRAM OVERLAY

GREEN RIVER RESOURCE AREA H2S LOCATIONS
500 ppm H2S Radius of Exposure
Based on Maximum Production Rates
(Baseline date: December 7, 1988)

Well Name & Number	¼¼	Sec	Twn	Rng	Formation	Well Status	Max Rate (mcfpd)	H2S (%)	H2S (ppm)	500 ppm ROE (ft)
3	NENW	06	14N	112W	Morgan	TA	5,431	11.0000%	110,000	2,515
8	SESW	01	14N	113W	Morgan	TA	4,500	10.0000%	100,000	2,106
8	NWNW	13	14N	113W	Morgan	TA	2,616	11.0000%	110,000	1,592
Polumbus Federal #1-1	SWSW	01	15N	104W	Phosphoria	GSI	6,100	0.0001%	1	2
Federal #1-2	SESE	02	15N	104W	Phosphoria	GSI	5,390	0.0001%	1	2
Federal #3-11	ENW	11	15N	104W	Phosphoria	GSI	2,376	0.0001%	1	1
1	SWNE	29	15N	112W	Morgan	TA	5,700	11.0000%	120,000	2,737
1-25	SESE	25	15N	113W	Morgan	GSI	6,000	12.0000%	120,000	2,827
Brady Plant Inlet - Compressor			16N	101W			60,000	0.2500%	2,500	1,059
Brady Plant Inlet - Non-Compressor			16N	101W			60,000	1.5000%	15,000	3,250
Brady Plant Outlet			16N	101W			60,000	1.5000%	15,000	3,250
23-W	NWNE	01	16N	101W	Weber	INJ	7,122	1.7300%	17,300	936
30-N	SWSE	02	16N	101W	Nugget	POW	512	0.1200%	1,200	34
36-N	SESW	02	16N	101W	Nugget	POW	677	0.7500%	7,500	127
8-N	NWSE	02	16N	101W	Nugget	POW	1,198	0.2800%	2,800	98
13-W	NWNW	02	16N	101W	Weber	GSI	2,505	1.7300%	17,300	487
2-W	NENE	02	16N	101W	Weber	PGW	3,766	1.7500%	17,500	633
34-W	NESW	02	16N	101W	Weber	PGW	6,200	2.0000%	20,000	940
38-W	ESE	02	16N	101W	Weber	INJ	2,300	1.7300%	17,300	462
9-N	NESE	10	16N	101W	Nugget	POW	1,021	1.6000%	16,000	288
11-W	SWNE	10	16N	101W	Weber	INJ	7,122	1.7300%	17,300	936
27-N	NWSW	11	16N	101W	Nugget	POW	990	0.2400%	2,400	79
30-N	SENW	11	16N	101W	Nugget	POW	1,110	0.9800%	9,800	208
5-N	NWNW	11	16N	101W	Nugget	POW	1,067	0.3200%	3,200	53
13-W	SESE	11	16N	101W	Weber	INJ	3,794	1.7300%	17,300	631
4-W	NENW	11	16N	101W	Weber	PGW	3,818	1.9000%	15,000	672
38-W	NWSW	11	16N	101W	Weber	PGW	6,225	1.9000%	15,000	913
4-W	NWNW	12	16N	101W	Weber	INJ	7,122	1.7300%	17,300	936
21-W	SWSW	14	16N	101W	Weber	INJ	7,122	1.7300%	17,300	936
22-W	SENW	15	16N	101W	Weber	INJ	7,122	1.7300%	17,300	936
3-W	NENE	15	16N	101W	Weber	GSI	4,197	1.7300%	17,300	673
10-P	NENW	22	16N	101W	Phosphoria	GSI	1,475	3.0000%	30,000	499
12-P	NWNW	27	16N	101W	Phosphoria	TA	1,500	3.0000%	30,000	499
South Baxter Plant			16N	104W			3,000	0.0850%	850	83
17	SWNW	03	16N	104W	Frontier	PGW	1,475	0.0850%	850	79
8	NWNW	10	16N	104W	Frontier	PGW	2,630	0.0850%	850	79
12	SESW	16	16N	104W	Dakota	PGW	757	0.0850%	850	35
15	SESE	16	16N	104W	Dakota	PGW	610	0.0850%	850	31
1	SWNE	21	16N	104W	Dakota	PGW	5,000	0.0850%	850	114
8	NWNW	22	16N	104W	Dakota	GSI	60,000	0.0850%	850	539
Butcher Knife Spring Plant			16N	112W			15,000	10.0000%	100,000	4,474
31	SENE	21	16N	112W	Morgan	PGW	11,780	5.0000%	50,000	2,493
26-E	SENE	04	17N	100W	Entrada	GSI	2,069	0.0600%	600	53
25-N	SSE	04	17N	100W	Nugget	POW	792	0.3000%	3,000	79
35-N	NESE	04	17N	100W	Nugget	POW	313	0.1400%	1,400	27
39-N	SESW	04	17N	100W	Nugget	OSI	33	0.1900%	1,900	8
11-W	SWSE	04	17N	100W	Weber	PGW	3,127	0.5000%	5,000	251
17-N	WNE	09	17N	100W	Nugget	POW	1,315	0.1800%	1,800	79
39-N	NENE	09	17N	100W	Nugget	POW	190	0.1500%	1,500	27
11-W	SENW	31	17N	100W	Weber	GSI	1,969	0.9500%	9,500	288
21-W	NESE	36	17N	101W	Weber	INJ	5,133	1.7300%	17,300	763
TR22	NESW	02	18N	098W	Madison	PGW	20,000	2.0000%	20,000	1,957
TR23	NWNE	02	18N	098W	Madison	GSI	23,000	2.0000%	20,000	2,135
TR21	NESE	10	18N	098W	Madison	GSI	19,000	2.0000%	20,000	1,895
TR33	NWNW	11	18N	098W	Madison	GSI	20,000	2.0000%	20,000	1,957
2-W	NWSE	21	18N	098W	Weber	PGW	9,075	3.1000%	31,000	1,570
11-W	SENW	28	18N	098W	Weber	TA	22	1.7300%	17,300	25
Champlin 162 Amoco A #1	NWSW	19	18N	103W	Dakota	GSI	5,439	0.0300%	300	63
CIG Plant			19N	098W			35,000	2.0000%	20,000	2,777
TR37	SWSW	25	19N	098W	Weber	PGW	4,450	4.5000%	45,000	1,269
TR19	SESE	35	19N	098W	Ericson	SWD	750	2.0000%	20,000	251
1	NWSW	12	24N	112W	Madison	GSI	13,140	2.0000%	20,000	1,504
35-22	SENW	35	26N	112W	Madison	GSI	2,200	0.3500%	3,500	165

APPENDIX 7-7

MINING METHODS

MINING METHODS FOR COAL

In the early 1870s, coal mines were all underground; today the major producing coal mines on the Rock Springs uplift are open pit surface coal mines. The resource area contains coal beds that are suitable for both open pit surface mining and underground mining methods. Open pit surface mining in the resource area is done with draglines, electric shovels, scrapers, and front-end loaders.

A typical dragline operation consists of blasting the overburden, and leveling of the area to facilitate the movement of the dragline. The overburden is then removed by the dragline and placed along the updip side known as the low wall. During the excavation of the overburden, the dragline may also cut ramps approximately 3,000 feet apart for use in haulage. After the coal is removed, the dragline will then move downdip and proceed to remove the overburden parallel to the previous pit. The dragline operation may be assisted by a truck/shovel operation to prepare a level pad for the dragline.

A typical truck shovel open pit operation consists of blasting and removal of the overburden in 40-foot benches followed by coal removal. Initially, a ramp is prepared to facilitate haulage of the overburden to an outside area, and as adequate room is established, in-pit backfilling will begin. The truck/shovel operation is used where geologic structure is more complicated, topography is rugged and multiple coal seams occur.

After the overburden is removed by one of the two methods, the coal surface is cleaned using rubber tired dozers or motor graders. The coal is then broken up with thinner seams being ripped by a tracked dozer and thicker seams being drilled and blasted in a manner similar to the overburden blasting operation. The coal is loaded with front-end loaders or shovels into 100 to 150 ton coal haulers to processing plants or crushers and overland conveyors.

Underground coal mining operations are classified according to the type of equipment used, such as conventional, continuous, longwall, or shortwall. Within the resource area only the conventional and continuous mining operations are used.

Conventional mining methods consist of several sequences. The coal face is first undercut, center cut or top cut by a large cutting machine that resembles an oversized chainsaw. The face is then drilled and loaded with explosive, then blasted. Coal is loaded and transported by shuttle cars to a conveyor or unloading point. After the coal is removed, the roof is supported by roof bolting and in some cases by wooden timbers or steel crossbars on posts. The cycle is then repeated.

Continuous miners are single driven machines that break the coal mechanically and load it for transportation. There are three types of continuous miners; the Boring-miner, the ripper-miner and the milling- or drum-miner. The milling- or drum-type continuous miner is the most widely used, cutting the coal by a picking action from bit wheels on a cutting head which rotates parallel to the coal face. The advance of a continuous miner is limited to the length of the machine, ventilation, and the need to keep the operator under a supported roof.

MINING METHODS FOR SODIUM

The mineral trona (the raw material mined for the production of soda ash) is recovered by underground mining operations within the resource area. There are five mining methods to extract trona ore: conventional, continuous, longwall, shortwall, and solution mining. Solution mining is not presently used within the resource area.

The conventional mining sequence is a five step process: a center vertical cut in the face followed by drilling for blast holes in a set pattern, loading the drill holes,blasting of the face, removal of the broken trona ore, and bolting of the roof in a set pattern. Room sizes (areas where trona ore was removed) are typically 16 to 18 feet wide by 8 to 9 feet high. Pillars (areas left intact to support the overlying rock) are typically 60 feet by 70 feet. This method is generally used in areas of short mining life and for high extraction percentages of ore.

The continuous mining method uses one of two types of mining machines known as a borer miner and drum miner. These machines continuously scrape and cut the trona as the achines move forward. Trona is then loaded into shuttle cars and transported to conveyor belts where it is removed to storage bins and hoisted to the surface. The drum miner cuts an opening 14 to 16 feet wide and a maximum of 10 feet high. Pillars are typically left 90 feet by 100 feet for roof support. The borer miner is typically used where long-term entries are needed, as these entries are rounded and very stable over long periods. Borer miner entries are 14 feet wide by 8 feet high, and pillars are 125 feet wide by 100 feet long.

Longwall mining methods are used to extract ore outlined in the development process, in a single, continuous operation. In this operation, hydraulic jacks or self-advancing jack units support the roof where the trona is being removed. As the trona is removed, supports advance forward leaving the strata to cave behind the support jacks. Longwall Shearers are used to cut the trona ore. The Shearer, mounted on the face conveyor, consists of two drums with cutting bits. The drum shearer can cut in either direction with the lead drum cutting 5 feet and the trail drum cutting 3 to 4 feet. A typical longwall panel runs 400 feet wide and in excess of 3,000 feet long, and can take up to one year to completely mine.

Shortwall mining is a combination of continuous mining with the longwall system jacks. This system can be visualized as a short tunnel being made wider and wider as the continuous miner makes each successive pass. The hydraulic jacks are moved in a manner similar to the longwall system with the roof caving behind shields.

APPENDIX 7-8

EXPLORATION

COAL EXPLORATION PROCEDURES

Coal exploration may consist of several individual programs including reconnaissance mapping and sampling, and some form of drilling. Within the resource area, the U.S. Geological Survey has mapped most of the coal seams exposed at the surface. Currently, most reconnaissance work consists of verifying existing coal maps by re-visiting the specific areas or by analyzing high-altitude aerial photographs. Normally, if the site is visited, samples of the coal and the surrounding rocks are taken for chemical analysis to obtain average coal quality values and generalized geologic information. The weathered coal outcrop is an unreliable source for quality data and care must be taken to get a sample that accurately represents the coal seam.

After reconnaissance and verification of a prospect is completed, an exploration drilling program may be designed to further evaluate the identified coal area. The drilling program preliminary objective is to establish the presence and thickness of coal and an in-place coal reserve estimate. Core drilling, which produces a physical sample of the coal and surrounding rock is extensively used for evaluation of engineering and geologic factors. Test holes that are not cored are rotary drilled, yielding chip samples for description of the rock units penetrated. Although coal chip samples are not totally cleaned some reliable geochemical data can be obtained. After the drill hole is completed, it may then be logged using one or more geophysical methods. This results in a line trace showing specific rock properties, such as porosity, resistivity, and natural radiation. The line trace is correlated to the drill hole footage and upon interpretation the different rock units can be identified. As successive holes are completed and geophysically logged, coal beds can be correlated and aveally (?) traced.

After the drilling project is completed and all sample analyses have been reviewed, the geologist and the engineer can then prepare an evaluation of a potential mining venture on the property.

COAL EXPLORATION LICENSE

No person may conduct coal exploration activities for commercial purposes without an exploration license. Exploration activities conducted without a license shall be in violation of 43 CFR 3410.2, shall constitute trespass, and shall be subject to the provisions of 43 CFR 9239.5-3(f).

Exploration licenses may be issued for:

1. Lands administered by the Secretary that are subject to leasing under 43 CFR 3400.2.
2. Lands administered by the Secretary of Agriculture through the Forest Service or other agency that are subject to leasing under 43 CFR 3400.2.
3. Lands which have been conveyed by the United States subject to a reservation to the United States of the mineral or coal deposits, to the extent that those deposits are subject to leasing under 43 CFR 3400.2.
4. Acquired lands set apart for military or naval purposes.

No exploration license shall be issued for lands included in an existing coal lease.

Application for Exploration License

Exploration license applications within the resource area shall be submitted to the Wyoming State Director. The applications shall be subject to the following requirements:

1. No specified form of application is required.
2. An area for which an application is filed shall be described by legal description in accordance with 43 CFR 3471.1-1(d)(1). An application on acquired lands shall describe the area in accordance with 43 CFR 3471.1-1(d)(2).
3. Each application shall contain three copies of an exploration plan which complies with the requirements of 43 CFR 3482.1(a).
4. Each application and its supporting documents shall be filed with a nonrefundable filing fee of $250 (43 CFR 3473.2-1).
5. Applications shall normally cover no more than 25,000 acres in a reasonably compact area and entirely within one state. An application for a license

covering more than 25,000 acres must include a justification for an exception to the normal acreage limitation.

Nothing shall preclude the authorized officer from issuing a call for expressions of leasing interest in an area containing exploration licenses or applications for exploration licenses.

Applicants for exploration licenses shall be required to provide an opportunity for other parties to participate in exploration under the license on a pro rata cost sharing basis (43 CFR 3410.2-1(c)). The authorized officer may require modification of the original exploration plan to accommodate the legitimate exploration needs of persons seeking to participate, and to avoid the duplication of exploration activities in the same area, or may notify the person seeking to participate that the person should file a separate application for an exploration license. An application to conduct exploration which could have been conducted as a part of exploration under an existing or recent coal exploration license may be rejected.

Environmental Analysis

Before an exploration license may be issued, the authorized officer shall prepare an environmental analysis of the potential effects of the proposed exploration on the natural and socioeconomic environment of the affected area. In accordance with 43 CFR 3410.2-2, no exploration license shall be issued if the exploration would:

1. Result in disturbance that would cause significant and lasting degradation to the lands or injury to improvements, or result in disturbance other than that necessary to determine the nature of the overlying strata and the depth, thickness, shape, grade, quantity, quality or hydrologic conditions of the coal deposits; or

2. Jeopardize the continued existence of a threatened or endangered species of fauna or flora or destroy or cause adverse modification to the critical habitat. No license shall be issued unless exploration is in compliance with Sections 105 and 106 of the National Historic Preservation Act (16 U.S.C. 470(f)).

The authorized officer shall include in each exploration license requirements and stipulations to protect the environment and associated natural resources and to ensure reclamation of the lands disturbed by the exploration.

Surface Management Agency

The authorized officer may issue an exploration license covering lands the surface of which is under the jurisdiction of any Federal agency other than the BLM only in accordance with those conditions prescribed by the surface management agency concerning the use and protection of the nonmineral interests in those lands.

Issuance and Termination of an Exploration License

The authorized officer has the discretion to issue an exploration license or to reject the application under 43 CFR 3410.3-1. A license shall become effective on the date specified by the authorized officer and shall not be valid for more than two years from its effective date. The approved exploration plan shall be attached and made a part of each license.

Subject to the continued obligation of the licensee and the surety company to comply with the terms and conditions of the exploration license, the exploration plan, and the regulations, a licensee may relinquish a license for all or any portion of the lands covered by it (see 43 CFR 1821). An exploration license may be canceled by the authorized officer for noncompliance with its terms and conditions, the exploration plan, or the regulations.

When unforeseen conditions that could result in substantial disturbance to the natural land surface or damage to the environment or improvements are encountered, or when geologic or other physical conditions warrant:

1. The authorized officer may adjust the terms and conditions of the exploration license, or

2. The authorized officer may direct adjustment in or approve modification of the exploration plan.

Exploration licenses shall not be extended and operations may not be conducted after the license has expired. The licensee may apply for a new license which may be issued simultaneously with the termination of the existing license.

Limitations on Exploration Licenses

The issuance of exploration licenses for an area shall not preclude the issuance of a Federal coal lease under applicable regulations. If a coal lease is issued for lands included in a license, the authorized officer shall cancel the license on the effective date of the lease, for those lands which are common to both.

Operating Regulations

The licensee shall comply with the provisions of the operating regulations of the BLM (43 CFR 3480). Authorized representatives of the Secretary and, where appropriate, the surface management agency shall be permitted to inspect the premises and operations. The licensee shall allow the free ingress and egress of government officers and other persons using the land under authority of the United States.

Bonds

Bonding provisions are found under 43 CFR 3474. Prior to issuing an exploration license, the authorized officer shall ensure that the amount of the bond to be furnished is sufficient. Upon completion of exploration and reclamation activities that are in compliance with the terms and conditions of the exploration license, the exploration plan and the regulations or upon discontinuance of exploration operations and completion of needed reclamation to the satisfaction of the authorized officer, and where appropriate, the surface management agency, the authorized officer shall terminate the period of liability of the bond.

Where the surface of the land being explored is privately owned, the authorized officer shall have the authority to terminate or adjust the period of liability and/or the amount of liability under the bond. Should the licensee and any surface owner be unable to agree on the adequacy of the reclamation, the authorized officer shall make the final determination.

Collection and Submission of Data

The authorized officer may require the applicant to collect ground and surface water data that are available to the licensee in the conduct of the approved exploration plan.

The licensee shall furnish the authorized officer copies of all data (including, but not limited to, geological, geophysical and core drilling analyses) obtained during exploration in a form requested by the authorized officer. All data shall be considered confidential and not made public until the areas involved have been leased or until the authorized officer determines that public access to the data would not damage the competitive position of the licensee, whichever comes first.

SODIUM PROSPECTING PERMITS

Sodium prospecting permits may be issued for those lands or minerals subject to leasing, public or acquired, that have not been identified within a known sodium leasing area.

An application for a prospecting permit shall comply with all the requirements listed in 43 CFR 3522. After initial review and clearance of the application, but prior to issuance of the permit, the authorized officer shall require the applicant to file an exploration plan reasonably designed to determine the existence or workability of the deposit. The exploration plan shall, insofar as possible, include the following:

1. The names, addresses and telephone numbers of persons responsible for operations under the plan and to whom notices and orders are to be delivered.
2. A brief description, including maps, of geologic, water, vegetation, and other physical factors, and the distribution, abundance, and habitat of fish and wildlife, particularly threatened and endangered species, that may be affected by the proposed operation within the area where exploration is to be conducted, and the present land use within and adjacent to the area.
3. A narrative description showing;
    a. The method of exploration and types of equipment to be used.
    b. The measures to be taken to prevent or control fire, soil erosion, pollution of surface and ground water, pollution of air, damage to fish and wildlife or their habitat and other natural resources and hazards to public health and safety, including specific actions necessary to meet all applicable laws and regulations.
    c. The method for plugging drill holes.
    d. The measures to be taken for surface reclamation.

4. The estimated timetable for each phase of the work and for final completion of the program.
5. Suitable topographic maps or aerial photographs showing existing bodies of surface water, topographic, cultural and drainage features and the proposed location of drill holes, trenches and roads; and
6. Such other data as may be required by the authorized officer.

SODIUM EXPLORATION LICENSES

Private parties, jointly or severally, may apply for exploration licenses to explore known, unleased deposits of sodium or any sodium compound to obtain geologic, environmental and other pertinent data concerning such deposits. 43 CFR 3524, except as otherwise specifically provided in the Federal Regulations, and he regulations pertaining to land use authorizations under 43 CFR 2920 shall govern the issuance of licenses. All applications for exploration licenses shall include an exploration plan which is in full compliance with 43 CFR 3522.3-3.

Applicants for exploration licenses shall be required to publish a Notice of Exploration inviting other parties to participate in exploration under the license on a pro rata cost sharing basis. The authorized officer may issue the license naming participants and acreage covered, establishing core hole spacing, and resolving any other issue necessary to minimize surface disturbance and inconsistencies between proposed exploration plans.

The licensee shall furnish the authorized officer copies of all data obtained during exploration. All data shall be considered confidential and not made public until the areas involved have been leased or until the authorized officer determines that the data are not exempt from disclosure under the Freedom of Information Act, whichever occurs first.

APPENDIX 7-9

COAL AND SODIUM LEASING PROCEDURES

COAL LEASING BY APPLICATION - GREEN RIVER - HAMS FORK REGION

Filing An Application

An application for a coal lease shall be filed with the Wyoming State Director. Federal regulations governing leasing by application are 43 CFR 3425. Specifically, leasing which results from application can either be in accordance with the emergency leasing provisions of 43 CFR 3425.1-4 or the leasing outside coal production regions provision of 43 CFR 3425.1-5.

The applicant must file three copies of the application with a filing fee of $250 (43 CFR 3425.1-1 and .1-2) and must include their name and address and a signed statement containing the names of all parties of interest in the application. Any application must also include a signed statement showing that the applicant does not hold, own, or control leases on more than 46,080 acres in one state, or not more than 100,000 acres in the United States at the time of application (30 U.S.C. 184(a)(2)).

The application must include a complete and accurate description of the affected lands (43 CFR 3471), preliminary data necessary to assist the Bureau in preparing an environmental analysis (see 43 CFR 3425.1-7), and appropriate signatures. While not required as part of the application, evidence of surface owner consent must be filed prior to posting of the notice of sale (43 CFR 3427).

Application Evaluation

Upon receipt of an application the Wyoming State Office of the BLM ensures that the filing fee was submitted, establishes a case file number, and records the legal description on the title plats. Thereafter, the State Office adjudicator examines the application to ensure that:

A. The application was filed in triplicate.

B. The applicant is qualified to hold Federal leases in accordance with 43 CFR 3472 and the applicant's coal holdings plus the lands applied for do not exceed the acreage limitations.

C. The preliminary data are complete. After reviewing the preliminary data contained in an application and at any time during an environmental analysis, the State Director authorized officer may request additional information from the applicant.

D. The lands are properly described in the application.

E. The lands are available for lease.

F. If the application is submitted under the emergency leasing provisions, there is documentation demonstrating that the application meets the emergency criteria in 43 CFR 3425.1-4.

Notification of Governor

After the evaluation by the Adjudicator is completed, the State Director notifies all regional coal team members, including the Governor of the affected State and all ex-officio members, that a lease application has been filed with the BLM office. If an application is subsequently rejected, the Governor is notified of such action. This notification may also serve as the consultation required by 43 CFR 3420.4-3.

District Office Review and Recommendation

After the BLM Wyoming State Office completes the application evaluation, the BLM District Office, which has jurisdiction over the application area, will take the following actions:

A. Assure that leasing of the subject area is in conformance with the Resource Management Plan and the plan complies with the regulations in 43 CFR 1600 and 3400. If the surface over the Federal coal in the application area is under the jurisdiction of another Federal land management agency, then this land use plan conformance is conducted by the Wyoming State Office. Consultation with the Federal land management agency will be initiated as required by 43 CFR 3420.4-2.

B. Prepare an EA or EIS, as appropriate, for leasing of the application area. The District Manager prepares this document in accordance with 43 CFR 1500-1508 and Departmental Manual specifications.

C. Within the EA or EIS, review the Green River - Hams Fork Data Adequacy Standards and certify whether or not adequate data exists to be incompliance with these standards. In the event that the District Manager finds that adequate data does not exist then either (1) acquires the appropriate level of data, (2) proposes mitigation to be included as a lease stipulation conditioning development of the lease on collection and analysis of the data, or (3) justifies with his/her recommendation the basis for completing EA/EIS.

D. Develop, as part of the EA or EIS Record of Decision, those mitigation measures which warrant special lease stipulations should a lease be issued for the application area.

E. Prepare a geological report on the coal quantity and coal quality of each coal seam within the application area. The report must also address stripping ratio, fault evidence, burn evidence, and outcrop information. If adequate coal drilling data does not exist, then the District Manager is responsible for coordination with the applicant to acquire adequate data. Such data acquisition is the responsibility of the applicant and may be obtained via an exploration license per 43 CFR 3410.

F. Hold a public hearing in accordance with the requirements of 43 CFR 3425.4 to receive public comments on the EA/EIS, receive State comments on the proposed action in the EA/EIS and receive comments on fair market value and maximum economic recovery.

G. Recommend to the Wyoming State Director any modification to the application area which the District Manager feels appropriate after review of the above listed items.

Pre-Sale Economic Evaluation

After submission of the geological report and prior to any competitive lease sale, the Northwest Regional Evaluation Team shall prepare an estimate of the fair market value of the proposed lease offering. Specifically, this evaluation shall:

A. Estimate the appropriate bonus bid the Federal Government should receive as fair market value should a lease be issued for the application area.

B. Certify the adequacy of the geological data base, on which the economic evaluation is prepared.

C. Be kept confidential and be restricted to Government use only.

Regional Coal Team Participation

At each of its meetings or through notification of the members, the regional coal team will review the status of all lease applications which BLM is processing, particularly, those received since its last meeting. The regional coal team will focus its comments on applications which have been processed through Step II as described above (i.e., the application has been received and the applicant is qualified as required in 43 CFR 3472).

No final decision either to hold a lease sale or to reject the lease application will be made by the BLM State Director, until after regional coal team members have had an opportunity to review and comment on the regional implications of the application and provide guidance. At the request of any voting member of the regional coal team, a special regional coal team meeting will be held to review and give guidance concerning the processing of any lease application in addition to the annual regional coal team meeting for that purpose.

In reviewing lease applications, the regional coal team will consider the following:

A. Is the application(s) associated with or expected to cause significant regional impacts. If as the result of the coal team review, the application(s) is determined to have significant regional impacts, the BLM will prepare an EIS which contains both a site specific analysis of the impacts of the proposed leasing actions and the cumulative impacts of the proposed leasing/development(s) in combination with all other known and reasonably foreseeable projects.

B. Forty-five days prior to the annual regional coal team meeting or as otherwise directed by the team, the Project Manager will prepare and make available to the public an assessment of the regional market conditions, specifically analyzing and discussing the relationship between the pending lease application(s).

C. Whether (1) to receive and process additional lease applications, (2) to receive and hold additional lease applications until the next annual regional coal team meeting, or (3) cease receiving lease applications and return to the regional activity planning process. If the team determines to hold but not process applications or to stop receiving lease applications, BLM may continue to process any application(s) received which meet(s) the emergency leasing criteria of 43 CFR 3425.1-4.

D. Review the status of pending PRLAs, coal land exchanges, coal lease relinquishments, logical mining units, and other actions which could be related to lease applications.

E. The regional coal team shall monitor leasing activity on a continuing basis. It shall maintain criteria to be used to trigger a regional coal team meeting to consider changes in the leasing mode.

Final Consultations

For all lease applications, the State Director will consult with the entities listed below. The consultation period may be conducted simultaneously with the waiting period for the NEPA compliance document (i.e., the environmental assessment or environmental impact statement) or land use plan on the lease application. The request for consultation will allow a minimum of 30 days for response; failure to respond will be interpreted as consent to leasing under the terms and conditions deemed appropriate by BLM.

A. Surface Management Agency.

B. Governor of the State. Notice to the Governor may consist of the notice that the application has been received and invitation to participate in preparation of the environmental assessment.

C. Attorney General

Record of Decision

For each lease application, a Record of Decision prepared according to the requirements of 40 CFR 1500, will be prepared for signature by the State Director. The decision may:

A. Direct that a competitive lease sale be held in response to the lease application specifying any terms and conditions to be included in the lease as well as the necessary bond amounts.

B. Reject the application in total or in part for any of the following reasons:

1. BLM determines that the application is not consistent with applicable regulations;
2. Issuance of the lease would compromise the regional leasing process;
3. Leasing of the lands in the application for environmental or other sufficient reasons would be contrary to the public interest.

For all applications which are rejected, a 30-day appeal period is provided to the applicant and a notice of the rejection is sent to the Governor of the State concurrently with the notification to the applicant.

Lease Sales

All lease sales held in response to lease applications will be conducted according to the procedures of 43 CFR 3422 and BLM Manual/Handbook 3420-1, Chapter 4.

OPERATIONAL PROCEDURES FOR SODIUM LEASING BY APPLICATION, GREEN RIVER BASIN

Filing an Application

An application for a sodium lease may be filed with the Wyoming State Director. Federal Regulations governing the leasing process are 43 CFR 3500 through 3507 and 3520. Specifically, sodium leasing which results from these applications can either be in accordance with the preference right lease provisions of 43 CFR 3523, competitive leasing provisions of 43 CFR 3525, or noncompetitive; fringe acreage leases and lease modification provisions of 43 CFR 3526.

The applicant must file three copies of the application with a filing fee for a preference right lease of 25 cents per acre or fraction thereof. The filing fee for a noncompetitive lease is $25 and an advance rental payment of 25 cents per acre or fraction thereof. A competitive lease may only be initiated either through an expression of interest (no filing fee required) or on Bureau motion.

A preference right lease is issued only after the prospecting permit requirements of 43 CFR 3522.2 have been satisfied. Prospecting permits are issued only outside a designated known sodium leasing area.

No person, company, association or corporation may hold at any particular time, directly or indirectly, more that 5,120 acres under prospecting permits and leases in any one state, except that, where the Secretary determines pursuant to 30 U.S.C. 184(b)(2) that it is necessary to secure the economic mining of sodium compounds, holdings may equal 15,360 acres.

Contents of an Application-Preference Right Lease

The applicant shall include a statement of qualifications and holdings in accordance with 43 CFR 3502. The application shall contain a description of the lands in accordance with 43 CFR 3501.1. These lands shall have been included in a prospecting permit and shall not exceed the acreage limitation of 2,560 acres.

The application shall be accompanied by a map(s) which shows utility systems; the location of any proposed development or mining operations and facilities incidental thereto, including the approximate locations and the extent of the areas to be used for pits, overburden and tailings; and the location of water sources or other resources which may be used in the proposed operations or facilities incidental thereto.

The application shall include a narrative statement setting forth:

1. The anticipated scope, method and schedule of development operations, including the types of equipment to be used;

2. The method of mining anticipated, including the best available estimate of the mining sequence and production rate to be followed; and

3. The relationship, if any, between the mining operations anticipated on the lands applied for and existing or planned mining operations, or facilities incidental thereto, on adjacent Federal or non-Federal lands.

Before a preference right lease is issued, the authorized officer shall determine whether the permittee has discovered a valuable deposit of sodium or any sodium compound and whether the lands are chiefly valuable therefor. The determination shall be based on data furnished to the authorized officer by the permittee as required by 43 CFR 3590 during the life of the permit and supplemental data submitted at the request of the authorized officer to determine the extent and character of the deposit, the anticipated mining and processing methods, the anticipated location, kind and extent of necessary surface disturbance and measures to be taken to reclaim that disturbance.

The surface management agency, if other than the Bureau, shall review the application in accordance with 43 CFR 3500.9 and 3580, as applicable. The appropriate surface management agency may request supplemental data regarding surface disturbance and reclamation if not otherwise submitted under 43 CFR 3523.1-2.

The authorized officer shall issue a preference right lease to the holder of a prospecting permit who shows that, within the term of the permit, a valuable deposit of sodium or any sodium compound was discovered and that the lands are chiefly valuable therefor.

The authorized officer shall reject the application for a preference right lease if the authorized officer determines:

1. That the applicant did not discover a valuable deposit of sodium and/or the lands are not chiefly valuable therefor;

2. The applicant did not submit requested information in a timely manner; or

3. The applicant did not otherwise comply with the requirements of this subpart.

Contents of an Application-Noncompetitive Fringe Acreage Leases and Lease Modifications

The application shall make reference to the serial number of the lease if the lands adjoin an existing Federal lease; contain a complete and accurate description of the lands desired; include a showing that a sodium deposit or any sodium compound deposit extends from the applicant's adjoining lease or from private lands owned or controlled by the applicant; and including proof of ownership or control of the mineral deposit in the adjoining lands if not under a federal lease.

Before a fringe acreage lease may be issued or a lease modified under this subpart, the authorized officer shall determine the following:

1. The lands are contiguous to an existing Federal lease or to non-federal lands owned or controlled by the applicant;

2. The new lease for the fringe acreage is not in excess of 2,560 acres;

3. The acreage of the modified lease, including additional lands, is not in excess of 2,560 acres;

4. The mineral deposit is not in an area of competitive interest to holders of other active mining units in the area;
5. The lands applied for lack sufficient reserves of the mineral resource to warrant independent development;
6. That leasing the lands will result in conservation of natural resources and will provide for economical and efficient recovery as part of a mining unit; and
7. The surface management agency, if other than the Bureau, shall be consulted in accordance with 43 CFR 3500.9 and 3580.

Competitive Leasing Procedures

Lands subject only to competitive leasing where prospecting or exploratory work is unnecessary to determine the existence or workability of valuable deposits of sodium or any sodium compound may be leased only through competitive sale to the qualified bidder who offers the highest acceptable bonus bid, except as provided in 43 CFR 3508 and 3526. A competitive lease sale may be initiated either through an expression of interest or on Bureau motion in accordance with 43 CFR 3525. Prior to competitive lease offering, the surface management agency shall be consulted in accordance with 43 CFR 3500.9 and 3580.

Sale Procedures

Prior to a lease offering, the authorized officer shall publish a notice of lease sale and post a notice in the public room of the proper BLM office. The authorized officer shall also prepare and make available a detailed statement of sale.

After the authorized officer has determined that the highest qualified bid meets or exceeds fair market value, copies of the lease shall be sent to the successful bidder who shall sign and return the lease form, pay the balance of the bonus bid, pay the first year's rental, pay the publication costs and furnish the required lease bond.

APPENDIX 8-1

LANDS IDENTIFIED AS POSSIBLY SUITABLE FOR DISPOSAL

(ALTERNATIVES Preferred, B, and C)

Sale/Exchange - Lands Difficult to Manage

ACRES	LEGAL DESCRIPTION
55.23	T. 24 N., R. 99 W., Section 8: Lot 5, S½NE¼ SE¼
34.33	T. 24 N., R. 99 W., Section 9: Lot 1
128.00	T. 13 N., R. 101 W., Section 18: All of portions of Lots 6, 12, 13, 16, and 17
107.61	T. 13 N., R. 102 W., Section 13: Lots 1, 2, and 3
20.00	T. 27 N., R. 103 W., Section 4: S½NW¼NE¼
80.00	T. 30 N., R. 105 W., Section 20: NW¼NE¼, NE¼NW¼
40.00	T. 19 N., R. 106 N., Section 34: SW¼SE¼
80.00	T. 19 N., R. 107 W., Section 34: N½NE¼NE¼, N½NE¼NW¼, W½NW¼SW¼, E½NE¼SE¼
17.53	T. 12 N., R. 111 W., Section 6: Lots 11, 12, and 13
15.56	T. 12 N., R. 112 W., Section 1: Lots 5, 6
7.39	T. 12 N., R. 112 W., Section 13: Lot 4

Sale/Exchange - Lands Available for Community or Industrial Expansion

80.00	T. 21 N., R. 101 W., Section 24: N½SW¼.
640.00	T. 21 N., R. 101 W., Section 36: All
640.00	T. 18 N., R. 104 W., Section 2: All
640.00	T. 18 N., R. 104 W., Section 14: All
640.00	T. 18 N., R. 104 W., Section 20: All
160.00	T. 18 N., R. 104 W., Section 22: NW¼
82.87	T. 18 N., R. 105 W., Section 8: Lots 5, 6
320.00	T. 18 N., R. 105 W., Section 18: S½
640.00	T. 18 N., R. 105 W., Section 30: All
80.00	T. 19 N., R. 105 W., Section 2: E½SW¼
120.00	T. 19 N., R. 105 W., Section 4: N½SE¼, SE¼SE¼
160.00	T. 19 N., R. 105 W., Section 8: E½E½
640.00	T. 18 N., R. 106 W., Section 24: All
315.62	T. 17 N., R. 107 W., Section 6: Lots 10-14, SW¼NW¼, E½SW¼
640.00	T. 17 N., R. 107 W., Section 8: All
640.00	T. 18 N., R. 108 W., Section 10: All
640.00	T. 18 N., R. 108 W., Section 14: All
640.00	T. 18 N., R. 108 W., Section 24: All
640.00	T. 18 N., R. 108 W., Section 36: All
40.00	T. 17 N., R. 107 W., Section 4: NE¼NE¼
40.00	T. 19 N., R. 103 W., Section 10: NE½NW¼

Recreation and Public Purposes Lands

159.54	T. 19 N., R. 105 W., Section 4: Lots 5,6, S½NE¼
125.54	T. 19 N., R. 105 W., Section 14: Lots 9, 10, 16
504.10	T. 19 N., R. 105 W., Section 16: Lots 5-16
134.83	T. 19 N., R. 105 W., Section 28: Lots 3, 4, 5, 23

APPENDIX 8-1

(ALTERNATIVES Preferred, B, and C) (Continued)

Exchange

ACRES	LEGAL DESCRIPTION
329.92	T. 19 N., R. 108 W., Section 6: Lots 8-17, S½ NE¼, SE¼NW¼, NE¼SW¼
640.00	T. 25 N., R. 112 W., Section 3: All
640.00	T. 25 N., R. 112 W., Section 9: All
640.00	T. 25 N., R. 112 W., Section 10: All
640.00	T. 25 N., R. 112 W., Section 15: All

Landfill Sale

285.00	T. 18 N., R. 105 W., Section 20: W½ (excepting acreage sold previously to Solid Waste District #1.

Total Acreage: 13,043.07

NOTE: Reference Appendix 8-2

(ALTERNATIVE A)

40.00	T. 19 N., R. 98 W., Section 12: NE¼SE¼
320.00	T. 21 N., R. 102 W., Section 30: E½
320.00	T. 21 N., R. 102 W., Section 32: N½
560.00	T. 21 N., R. 102 W., Section 34: N½ , N½ S½ , SW¼SW¼, SE¼SE¼
40.00	T. 18 N., R. 105 W., Section 6: SE¼SE¼
492.30	T. 18 N., R. 105 W., Section 8: Lots 1-10, 15, 16
314.47	T. 18 N., R. 105 W., Section 18: Lots 7, 8, E½ SW¼, SE¼
280.00	T. 19 N., R. 105 W., Section 2: SE¼NE¼, E½ SW¼, S½ N½ NW¼SW¼, S½ NW¼SW¼, SW¼SW¼, E½ SW¼
399.12	T. 19 N., R. 105 W., Section 4: Lots 5-8, S½ NE¼, NW¼SW¼, N½ SE¼, SE¼SE¼
400.00	T. 19 N., R. 105 W., Section 8: N½ NE¼, SE¼NE¼, SE¼NW¼, E½ SW¼, SE¼
188.25	T. 19 N., R. 105 W., Section 14: Lots 8-10, 16, 25, 27-30
503.83	T. 19 N., R. 105 W., Section 16: 5-16
162.42	T. 19 N., R. 105 W., Section 22: Lots 3-6
134.78	T. 19 N., R. 105 W., Section 28: Lots 2, 6, 7, 23
300.04	T. 19 N., R. 105 W., Section 32: Lots 1, 2, 7, 8
320.00	T. 20 N., R. 105 W., Section 20: E½
480.00	T. 20 N., R. 105 W., Section 28: E½ , N½ NW¼, SE¼NW¼, NE¼SW¼
160.00	T. 18 N., R. 106 W., Section 12: SE¼SW¼, NE¼SE¼, S½ SE¼
240.24	T. 18 N., R. 107 W., Section 6: Lots 8-9, S½ NE¼, E½ SE¼
200.00	T. 18 N., R. 107W., Section 8: NE¼, NE¼NW¼
607.61	T. 18 N., R. 107 W., Section 16: Lots 2-16
500.00	T. 18 N., R. 107 W., Section 24: N½ , N½ SW¼, SE¼SW¼, SE¼
640.00	T. 18 N., R. 108 W., Section 10: All
240.00	T. 18 N., R. 108 W., Section 12: N½ N½ , N½ S½ N½
640.00	T. 18 N., R. 108 W., Section 14: All
640.00	T. 18 N., R. 108 W., Section 24: All

Total Acreage: 9,123.06

APPENDIX 8-2

DISPOSAL CRITERIA

The Federal Land Policy Act of 1976 provides for retention of the public lands in federal ownership and management by BLM for multiple use and sustained yield of the lands and resources, with environmental integrity. Public lands may be transferred from BLM to other federal agencies for management. Disposal by sale, exchange or Recreation and Public Purpose patent remains an option if such an action will serve an important objective and have a public benefit.

Prior to any disposal, a site specific analysis must determine that the lands considered contain no significant wildlife, recreation, or other resource values the loss of which cannot be mitigated; have no overriding public values; and represent no substantial public investments. Disposal must serve the public interest. Exchange will be the priority method for disposals.

Lands will not be considered for disposal if they are allocated for a specific use, even though they meet the general disposal criteria.

EXCHANGES

The policy is to promote land exchanges which serve the national interest and are beneficial to BLM programs or which support the programs of other agencies (reference Sections 102, 205, and 206 of FLPMA).

Transfer of leasable minerals out of Federal ownership should be avoided except where non-Federal leasable minerals are to received in return. It is preferable to trade both surface and subsurface (mineral) estates.

Exchanges should involve lands similar in character and/or value. Proposals will not be considered where it is the intent to transfer acquired lands out of Federal ownership or control.

Exchanges should not be made solely for the purpose of blocking up Federal land ownership.

SALES

Public land sale proposals are the result of either a BLM initiative or in response to expressed public interest or need. Lands to be considered for disposal, at a minimum, must meet the following criteria as outlined in Section 203 of the Federal Land Management and Policy Act.

1. They are difficult and uneconomical to manage, and are not suitable for management by another Federal department or agency.

2. Disposal would serve important public objectives, including but not limited to, community expansion or economic development which could not be achieved prudently or feasibly on land other than public lands and which outweigh other public objectives or values.

3. Such tract was acquired for a specific purpose, and the tract is no longer required for that purpose or any other Federal purpose.

SALES/EXCHANGES INVOLVING WETLANDS

Bureau policy is to retain wetlands in Federal ownership unless Federal, State, public and private institutions, and parties have demonstrated the ability to maintain, restore, and protect wetlands and riparian habitats on a continuous basis (BLM Manual 6740). Sales/exchanges may be authorized when:

1. The tract of public wetlands is either so small or remote that it is uneconomical to manage.

2. The tract of public wetlands is not suitable for management by another Federal agency.

3. The patent contains restrictions of uses as prohibited by identified Federal, State, or local wetlands regulations.

4. The patent contains restrictions and conditions that ensure the patentee can maintain, restore, and protect the wetlands on a continuous basis.

RECREATION AND PUBLIC PURPOSES LEASE/PATENT

The objective of the R&PP Act is to meet the needs of State and local governmental agencies and other qualified organizations for public lands required for recreational and public purposes. Use of the R&PP Act protects public values in the land through its reversionary provisions and helps qualified entities obtain the more liberal pricing authorized under the act.

Public lands shall be conveyed or leased only for an established or definitely proposed project for which there is a reasonable timetable of development and satisfactory development and management plans. No more land than is reasonably necessary for the proposed use shall be conveyed.

DESERT LAND ENTRIES

The purpose of the Desert Land Law is to permit the reclamation by irrigation of arid public land through individual effort and private capital.

Lands which will not produce any reasonably remunerative agricultural crop by the usual means or methods of cultivation without artificial irrigation may be considered for a desert land entry. The lands must be untimbered, surveyed, unreserved, and unappropriated. Tracts need not be contiguous, but shall be sufficiently close to each other as to be managed satisfactorily as an economic unit.

The proposed crop may include any agricultural product to which the land under consideration is generally adapted and which would return a fair reward for the expense of producing it.

All Desert Land Entry applications will be coordinated with the Wyoming State Engineer and the Soil Conservation Service (reference Soils section).

APPENDIX 8-3

PROPOSED ACQUISITIONS (by alternative)

(PREFERRED ALTERNATIVE)

1. Acquire easements (approximately 300 acres) to provide access to public lands for resource needs.

2. Acquire riparian lands (840 acres).

3. Acquire 640 acres of land within the ¼ mile corridor or between river segments on the Big Sandy.

4. Acquire 2,400 acres of land within the ¼ mile corridor or between river segments on the Sweetwater River.

5. Acquire 1,920 acres of State inholdings in the Sand Dunes WSA.

6. Acquire 1,280 acres of State inholdings in the Honeycomb Buttes WSA.

7. Acquire 1,280 acres of State inholdings in the Devils Playground WSA.

8. Acquire 640 acres - Black Rock (West Red Desert HMP).

9. Acquire 2,420 acres in Prospect Mountains HMP.

10. Acquire 320 acres in Sage Creek/Currant Creek HMP.

11. Acquire 640 acres of State lands in the Greater Sand Dunes ACEC.

12. Acquire 40 acres - Fort LaClede.

13. Acquire 1,920 acres on Pine Butte to manage the candidate plant *Descurainia torulosa*.

14. Acquire 2,072 acres of State lands on Steamboat Mountain.

15. Acquire 4,020 acres of lands along Currant Creek/ Trout Creek.

16. Acquire SW of Section 16 - 10 acres - Rador Springs.

17. Acquire SW of Section 7 - 160 acres - Scott Meadows.

18. Acquire NWSW of Section 9 - 20 acres - Gunn Mining Townsite.

19. Acquire SW of Section 29 - 20 acres - Hallville Mine and Town.

20. Acquire N2NE, SWNE, NWSE, of Section 25 - 160 acres - Washington Homestead - Finley.

21. Acquire NENE of Section 1 - 40 acres - Big Pond Stage Station.

22. Acquire section 27 - 640 acres - Aspen Mountain Site.

23. Acquire 640 acres of State inholdings in the Sand Dunes and Buffalo Hump WSAs.

(ALTERNATIVE A)

1. Acquire 640 acres of land within the ¼ mile corridor or between river segments on the Big Sandy.

2. Acquire 2,400 acres of land within the ¼ mile corridor or between river segments on the Sweetwater River.

3. Acquire 1,920 acres of State inholdings in the Sand Dunes WSA.

4. Acquire 1,280 acres of State inholdings in the Honeycomb Buttes WSA.

5. Acquire 1,280 acres of State inholdings in the Devils Playground WSA.

6. Acquire 640 acres - Black Rock (West Red Desert HMP).

7. Acquire 2,420 acres in Prospect Mountains HMP.

8. Acquire 320 acres in Sage Creek/Currant Creek HMP.

9. Acquire 18,300 acres of State lands within the Red Desert Watershed.

10. Acquire 840 acres of riparian lands.

11. Acquire 40 acres - Fort LaClede.

12. Acquire 50 acres - road easements.
13. Acquire 640 acres of State lands in the Greater Sand Dunes ACEC.
14. Acquire 640 acres of State inholdings in the Sand Dunes and Buffalo Hump WSAs.

(ALTERNATIVE B)

1. Acquire easements (approximately 300 acres) to provide access to public lands for resource needs.
2. Acquire riparian lands (840 acres).
3. Acquire 640 acres of land within the ¼ mile corridor or between river segments on the Big Sandy.
4. Acquire 2,400 acres of land within the ¼ mile corridor or between river segments on the Sweetwater River.
5. Acquire 1,920 acres of State inholdings in the Sand Dunes WSA.
6. Acquire 1,280 acres of State inholdings in the Honeycomb Buttes WSA.
7. Acquire 1,280 acres of State inholdings in the Devils Playground WSA.
8. Acquire 640 acres - Black Rock (West Red Desert HMP).
9. Acquire 2,420 acres in Prospect Mountains HMP.
10. Acquire 320 acres in Sage Creek/Currant Creek HMP.
11. Acquire 18,300 acres of State lands within the Red Desert Watershed.
12. Acquire 40 acres - Fort LaClede.
13. Acquire 640 acres of State lands in the Greater Sand Dunes ACEC.
14. Acquire 640 acres of State inholdings in the Sand Dunes and Buffalo Hump WSAs.

(ALTERNATIVE C)

1. Acquire easements (approximately 300 acres) to provide access to public lands for resource needs.
2. Acquire riparian lands (840 acres).
3. Acquire 640 acres of land within the ¼ mile corridor or between river segments on the Big Sandy.
4. Acquire 2,400 acres of land within the ¼ mile corridor or between river segments on the Sweetwater River.
5. Acquire 1,920 acres of State inholdings in the Sand Dunes WSA.
6. Acquire 1,280 acres of State inholdings in the Honeycomb Buttes WSA.
7. Acquire 1,280 acres of State inholdings in the Devils Playground WSA.
8. Acquire 640 acres - Black Rock (West Red Desert HMP).
9. Acquire 2,420 acres in Prospect Mountains HMP.
10. Acquire 320 acres in Sage Creek/Currant Creek HMP.
11. Acquire 960 acres within the Red Desert Watershed.
12. Acquire 40 acres - Fort LaClede.
13. Acquire 640 acres of State lands in the Greater Sand Dunes ACEC.
14. Acquire 4,020 acres of lands along Currant Creek/Trout Creek.
15. Acquire 640 acres of State inholdings in the Sand Dunes and Buffalo Hump WSAs.
16. Acquire 1,920 acres on Pine Butte to manage the candidate plant *Descurainia torulosa.*

APPENDIX 8-3

RIPARIAN AQUISITIONS

(Preferred Alternative and Alternative C)

State lands as they come available for purchase or exchange (preferably both surface and mineral to avoid split estate).

Land Description	Sec	Twp.	Rng.	Approx. Acres
Trout Creek area:				
appr. NW¼ & N½SW¼	19	T13N	R105W	200
appr. NE¼ & N½SE¼	20			200
appr. S½SE¼	18			80
appr. SW¼ & NW¼	17			320
appr. S½SW¼	8			100
appr. N½NW¼	8			80
appr. W½	5			320
appr. W½	32	T14N	R105W	320
appr. W½	29			320
appr. W½	20			320
appr. S½SW¼	17			100
Currant Creek area:				
appr. NW¼SW¼	13	T13N	R106W	40
appr. NE¼NE¼	14			40
appr. NW¼SW¼	12			40
appr. NE¼NW¼	12			40
appr. N½SE¼ & S½NE¼	36	T14N	R106W	160
appr. N½SE¼ & NE¼	25			240
appr. SE¼ & S½NE¼	24			240
appr. E½NW¼NW¼	24			20
appr. W½NE¼NW¼	24			20
appr. W½SE¼SW¼	13			20
appr. E½SW¼SW¼	13			20
appr. N½SW¼ & S½NW¼	13			160
appr. N½NE¼	14			80
appr. S½SE¼	11			80
appr. S½SW¼	4			80

APPENDIX 9-1

ALLOTMENT MONITORING AND CATEGORIES

ALLOTMENT							
NUMBER	NAME	CATEGORY	ACTUAL USE	UTILIZATION	TREND	FIELD OBSERVATIONS	OTHER STUDIES
03000	GOLD CREEK	I	X	X	X	X	
03016	4TH OF JULY	I	X	X		X	
03028	EDEN PROJECT	None	X			X	
03202	JUEL PLACE	C	X			X	
03203	SPICER GROUP	C	X			X	
03204	GRASS CREEK	C	X			X	
03206	PULLEY PLACE	C	X			X	
03207	PACIFIC SPRINGS	C	X			X	
03214	JOHNSON PLACE	C	X			X	
03215	COOKSTON RANCH	C	X			X	
03303	JENSEN MEADOWS	C	X			X	
03304	BIG SANDY RANCH	C	X			X	
03307	HAY MEADOW	C	X			X	
03404	RICHIE PASTURE	C	X			X	
03407	HAY MEADOW EXC.	C	X			X	
04001	CIRCLE SPRINGS	I	X	X		X	
04007	RIFE	M	X	X		X	
04003	VERMILLION CREEK	I	X	X	X	X	
04004	ALKALI CREEK	M	X	X		X	
04005	CROOKED WASH	I	X	X		X	
04006	HORSESHOE WASH	I	X	X		X	
04007	PINE MOUNTAIN	I	X	X	X	X	SRT
04008	RED CREEK	I	X	X	X	X	SRT
04009	SALT WELLS	I	X	X	X	X	
04010	SUGARLOAF	I	X	X		X	
04011	SPRING CREEK	I	X	X	X	X	
04012	HENRYS FORK	I	X	X	X	X	
04013	HICKEY MOUNTAIN	I	X	X		X	SRT
04014	LARSEN	M	X	X		X	
04015	STAG HOLLOW	M	X	X		X	
04016	DONOHOO	C	X	X	X	X	
04017	POISON CREEK	C	X	X		X	
04018	BALD HILLS	I	X	X		X	
04019	HANKS	I	X	X		X	
04020	HISEY HOLLOW	C	X	X		X	
04021	CEDAR POINT	C	X	X		X	
04022	ANTELOPE	I	X	X		X	
04023	CIRCLE BAR	C	X	X		X	
04024	SAGE	C	X	X		X	
04025	COTTONWOOD CREEK	I	X	X		X	
04026	PEOPLES CANAL	C	X	X		X	
04027	MELLOR MOUNTAIN	I	X	X	X	X	
13001	WHITE ACORN	M	X	X	X	X	
13002	LITTLE PROSPECT	M	X	X	X	X	
13003	LITTLE SANDY	I	X	X	X	X	
13004	PROSPECT MOUNTAIN	I	X	X	X	X	
13005	POSTON	I	X	X	X	X	
13006	RESERVOIR	M	X	X	X	X	

APPENDIX 9-1

ALLOTMENT MONITORING AND CATEGORIES (Continued)

ALLOTMENT							
NUMBER	NAME	CATEGORY	ACTUAL USE	UTILIZA-TION	TREND	FIELD OBSERVATIONS	OTHER STUDIES
13007	PACIFIC CREEK	M	X	X	X	X	
13008	BAR X	M	X	X	X	X	
13009	FISH CREEK	I	X	X	X	X	
13010	PINE CREEK	I	X	X	X	X	
13011	CONTINENTAL PEAK	M	X	X	X	X	
13012	RED DESERT	M	X	X	X	X	
13013	BUSH RIM	M	X	X	X	X	
13014	STEAMBOAT MOUNTAIN	I	X	X	X	X	
13015	SANDS	I	X	X	X	X	
13017	EIGHTEEN MILE	I	X	X	X	X	
13018	ROCK SPRINGS	M	X	X		X	
13019	SANDY PASTURE	M					
13020	BUCKSKIN-SANDY	M	X	X	X	X	
13021	MACK FLAT	C					
13022	LOMBARD	I	X	X	X	X	
13023	FIGURE FOUR	I	X	X	X	X	
13024	BIG SANDY	M	X	X	X	X	
13025	HIGHWAY GASSON	I	X	X	X	X	
13026	BOUNDRY	M	X	X	X	X	
13027	SUBLETTE	I	X	X	X	X	
13100	JACK RANCH	C	X			X	
13101	UPPER WHITE ACORN	C	X			X	
13102	McCANN RANCH	C	X			X	
13103	EATON PLACE	C	X			X	
13104	LONG DRAW	C	X			X	
13105	ERRAMOUSPE	C	X			X	
13106	DEWEY PLACE	C	X			X	
13107	MIDDLE HAY	C	X			X	
13109	SWEETWATER	I	X			X	
13110	DEAD OX	C	X			X	
13114	CHILTON PLACE	C	X			X	
13115	HOUGHTON	C	X			X	

Note: Precipitation data is collected on all allotments.
X = Monitoring taking place

APPENDIX 9-2

MANAGEMENT DECISION PRIORITIES FOR IMPLEMENTATION (HIGH)

Continue monitoring to obtain data necessary to determine the need for changes in active use and/or management practices.

Allotment Number	Allotment Name	Priority	Year	Necessary Management Actions[1]
03000	Gold Creek	12	93	1, 4, 8, 10
04001	Circle Springs	23	95	1, 3, 4, 6
04002	Rife	28	95	1, 4
04003	Vermillion Creek	14	93	1, 4
04004	Alkali Creek	25	95	1, 2, 4, 6, 9(a)
04007	Pine Mountain	1	91	1, 6, 7, 8
04008	Red Creek	8	92	1, 4
04009	Salt Wells	6	92	1, 4, 6
04010	Sugarloaf	4	91	1, 2, 4, 6, 8
04011	Spring Creek	19	94	1, 6
04012	Henry's Fork	2	91	1, 5, 6, 8
04013	Hickey Mountain	13	93	1, 2, 4, 8
04018	Bald Hills	27	95	1, 2, 4, 8
04019	Hanks	26	95	1, 2, 4, 6, 8
04022	Antelope Wash	21	95	1, 2, 4, 6, 8
04023	Circle Bar	22	95	1, 2, 8, 9(B)
04024	Sage	18	94	1, 2, 8, 9(B)
04025	Cottonwood Creek	24	95	1, 2, 6, 8
04027	Mellor Mountain	17	94	1, 3, 6, 8
13004	Prospect Mountain	11	93	1, 4, 6, 7, 10
13005	Poston	16	94	1, 6, 7, 10
13009	Fish Creek	20	94	1, 7, 10
13010	Pine Creek	5	92	1, 4, 6, 10
13017	Eighteen Mile	10	93	1, 4, 6, 10
13022	Lombard	3	91	1, 3, 4, 7, 10
13024	Figure 4	9	92	1, 4, 6, 10
13025	Highway Gasson	7	92	1, 4, 6, 10
13026	Sublette	15	93	1, 6, 10

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[1] These management actions, monitoring studies, or changes to AMPs are planned for the allotments:

1. Continue existing monitoring studies
2. Develop/Implement AMP
3. Operational AMP (grazing system, projects)
4. Establish riparian area objectives and monitoring and incorporate into AMP
5. Divide allotment into separate allotments and write new AMPs for each
6. Construct projects or treat vegetation
7. Change or revise current existing grazing system
8. Establish additional monitoring studies
9. Change Category (A) M to I, or (B) C to I
10. Complete AMP evaluation and issue agreements or decisions regarding livestock use

APPENDIX 9-3

MANAGEMENT DECISION PRIORITIES FOR IMPLEMENTATION (LOW)

Monitoring indicates satisfactory management and progress toward or obtainment of management objectives. There is no need for change in active use and/or management practices. The appropriate management actions will begin by FY 1996 by allotment management priority.

Allotment Number	Allotment Name	Priority	Necessary Management Actions[1]
03028	Eden Project	35	Continuous Monitoring
03202	Juel Place	79	Continuous Monitoring
03203	Spicer Group	72	Continuous Monitoring
03204	Grass Creek	44	Continuous Monitoring
03206	Pulley Place	75	Continuous Monitoring
03207	Pacific Springs	57	Continuous Monitoring
03214	Johnson Place	54	Continuous Monitoring
03215	Cookston Ranch	71	Continuous Monitoring
03303	Jensen Meadows	56	Continuous Monitoring
03304	Big Sandy Ranch	46	Continuous Monitoring
03404	Richie Pasture	78	Continuous Monitoring
03307	Hay Meadow	69	Continuous Monitoring
04005	Crooked Wash	53	Continuous Monitoring
04006	Horseshoe Wash	68	Continuous Monitoring
04014	Larson	52	1
04015	Stag Hollow	74	Continuous Monitoring
04016	Donohoo	77	8(a)
04017	Poison Creek	62	1
04020	Hisey Hollow	70	1, 3, 5
04021	Cedar Point	61	Continuous Monitoring
04026	People's Canal	67	Continuous Monitoring
13001	White Acorn	37	Continuous Monitoring
13002	Little Prospect	43	2, 3
13003	Little Sandy	34	9
13006	Reservoir	42	2, 3, 9
13007	Pacific Creek	33	4, 9
13008	Bar-X	48	Continuous Monitoring
13011	Continental Peak	31	Continuous Monitoring
13012	Red Desert	41	Continuous Monitoring
13013	Bush Rim	38	Continuous Monitoring
13014	Steamboat Mountain	36	Continuous Monitoring
13015	Sands	32	Continuous Monitoring
13016	Fourth of July	63	Continuous Monitoring
13018	Rock Springs	30	3, 5
13019	Sandy Pasture	51	1, 6
13020	Buckskin Sandy	45	2, 3, 6
13021	Mack Flat	55	Continuous Monitoring
13024	Big Sandy	40	Continuous Monitoring
13026	Boundary	50	6
13100	Jack Ranch	39	Continuous Monitoring
13101	Upper White Acorn	60	Continuous Monitoring
13102	McCann Ranch	78	Continuous Monitoring

MANAGEMENT DECISION PRIORITIES FOR IMPLEMENTATION (LOW) (Continued)

Allotment Number	Allotment Name	Priority	Necessary Management Actions[1]
13103	Eaton Ranch	59	Continuous Monitoring
13104	Long Draw	66	Continuous Monitoring
13105	Erramouspe Ranch	49	Continuous Monitoring
13106	Dewey Place	73	Continuous Monitoring
13107	Middle Hay Place	65	Continuous Monitoring
13109	Sweetwater	64	7
13110	Dead Ox	58	Continuous Monitoring
13114	Chilton Place	47	Continuous Monitoring
13115	Houghton Ranch	76	Continuous Monitoring

[1] These management actions could be implemented to improve allotment management:

1. Establish additional monitoring studies
2. Construct projects or treat vegetation
3. Establish riparian area objectives and monitoring studies
4. Re-implement grazing system as livestock numbers increase.
5. Obtain Cooperative Riparian Area Management Agreement
6. Modify non-compliance fences
7. Combine with Fish Creek AMP
8. Change Category (A) C to M
9. Complete AMP evaluation
10. Develop/Implement AMP

APPENDIX 9-4

PROPOSED ALLOTMENT PROJECTS

Allotment Number	Allotment Category	Allotment Name	Proposed Projects[1]
03000	I	Gold CreekGold Creek	Prescribed Burns - 1,200 acres. When good livestock management of riparian zones has been accomplished under the Gold Creek AMP, prescribed burning in T. 29 N., R. 102 W., in the upper east and upper west pastures can then be accomplished.
03028	?	Eden Project	None
03202	C	Juel Place	Custodial
03203	C	Spicer Group	Custodial
03204	M	Grass Creek	
03206	C	Pulley Place	Custodial
03207	M	Pacific Springs	
03214	C	Johnson Place	Custodial
03215	C	Cookston Ranch	Custodial
03303	M	Jensen Meadows	M
03304	M	Big Sandy Ranch	M
03307	C	Hay Meadow	Custodial
03404	C	Richie Pasture	Custodial
04001	I	Circle Springs	Three reservoirs: T. 16 N., R. 103 W., Section 32 (2) T. 16 N., R. 103 W., Section 33 (1) Burn 771 acres
04002	M	Rife	None
04003	I	Vermillion Creek	None
04004	I	Alkali Creek	None
04005	M	Crooked Wash	Burn 508 acres
04006	M	Horseshoe Wash	Burn 538 acres
04007	I	Pine MountainNone	
04008	I	Red Creek	2.5 miles of fence (boundary between Pine Mountain and Red Creek Allotments, Section 4). 0.5 miles of pasture fence - (Section 4).

APPENDIX 9-4

PROPOSED ALLOTMENT PROJECTS (Continued)

Allotment		Allotment Name	Proposed Projects[1]
Number	Category		
04009	I	Salt Wells	None
04010	I	Sugarloaf	30.5 miles of fence; 2 pipelines totaling 5 miles; 5 spring developments; 3 water wells equipped with windmills; approximately 12,000-acre burn.
04011	I	Spring Creek	Approximately 1,400-acre burn.
04012	I	Henry's Fork	Construct 1 pipeline with troughs south of Twin Buttes in pasture F and 2 reservoirs in each pasture. All project construction in pastures E and F will be done outside of the Devil's Playground WSA.
04013	I	Hickey Mountain	Three reservoirs: 13 N., 113 W., Section 29 NW¼ 12 N., 114 W., Section 10 NW¼ 13 N., 114 W., Section 26 SW¼ Burn 512 acres
04014	M	Larson	None
04015	C	Stag Hollow	Custodial
04016	M	Donohoo	None
04017	C	Poison Creek	Custodial
04018	I	Bald Hills	Two spring developments: T. 12 N., R. 113 W., Section 13 NW¼ T. 12 N., R. 113 W., Section 13 SW¼ One reservoir: T. 12 N., R.113 W., Section 12 SE¼ Burn 1,362 acres.
04019	I	Hanks	Burn 910 acres.
04020	C	Hisey Hollow	Custodial
04021	C	Cedar Point	Custodial
04022	I	Antelope Wash	Four reservoirs: T. 12 N., R. 110 W., Section 07 SW¼ T. 12 N., R. 110 W., Section 10 NE¼ T. 12 N., R. 110 W., Section 15 NW¼ T. 12 N., R. 111 W., Section 01 Center
04023	I	Circle Bar	None

APPENDIX 9-4

PROPOSED ALLOTMENT PROJECTS (Continued)

Allotment Number	Allotment Category	Allotment Name	Proposed Projects[1]
04024	I	Sage	None
04025	I	Cottonwood Creek	Three reservoirs: - T. 12 N., R. 109 W., Section 07 SW¼ - T. 12 N., R. 109 W., Section 19 SW¼ - T. 12 N., R. 110 W., Section 11 NW¼ Burn 594 acres
04026	C	Peoples Canal	Custodial
04027	I	Mellor Mountain	Eight reservoirs: - T. 14 N., R. 104 W., Sections 8 & 21 - T. 14 N., R. 104 W., Sections 10 & 15 - T. 15 N., R. 103 W., Section 6 NE¼ - T. 15 N., R. 103 W., Sections 9 & 15 - T. 15 N., R. 105 W., Section 36 Burn 3,203 acres
13001	I	White Acorn	FENCE: **Purpose:** to divide two southern pastures. **Location:** START - approximately T. 28 N., R. 102 W., Section 7 NE¼NE¼; proceed south to T. 27 N., R. 102 W., Section 3 SE¼SE¼ **Length:** 7 miles - 2 strand barbed wire, 1 strand - bottom smooth (Future) PIPELINE: Pipeline from existing well - T. 27 N., R. 102 W., Section 13 NE¼SE¼, To proceed 1½ miles due south to T. 27 N., R. 102 W., Section 24 S½S½ with troughs at well and end of pipeline. Proposed for FY92. Proposed prescribed burn - 750 acres T. 29 and 30 N., R. 102 and 103 W. To be coordinated with Jack Bertagnolli. Mosaic to provide increased forage for livestock and wildlife.
13002	I	Little Prospect	1) Little Prospect Prescribed Burn This burn is to be accomplished in three parts with the 2-year growing season between each part. Electric fence will be used to deter livestock from using the newly burned areas for two growing seasons. Each burn will encompass from 600 to 1,000 acres of area burned in a mosaic pattern - T. 28 and 29 N., R. 102 and 103 W.

PROPOSED ALLOTMENT PROJECTS (Continued)

Allotment Number	Allotment Category	Allotment Name	Proposed Projects[1]
		Little Prospect (Continued)	2) Lander Creek Meadows Fence Used as art of the corral fence below the Juel Place, crosses BLM land for approximately 200 feet in T. 29 N., R. 103 W., Section 15 NE¼SE¼.
13003	I	Little Sandy	1) New Well and Pipeline: T. 28 N., R. 105 W., Section 29 NW¼NW¼. Well location. Two 1-mile pipelines to distribute water and livestock use - BLM drills and cases wells. BLM to provide materials and install pipelines. 2) Butte Fence and Cattleguard T. 28 N., R. 105 W., Sections 24, 26, 27. Drift fences between the buttes with cattleguard at the road in Section 27 NW¼ crossing. 3) Seep Development T. 28 N., R. 105 W., Section 15 NW¼NW¼ - install a perforated culvert to act as a water collector and pipe to a trough.
13004	I	Prospect Mountain	Construct 2 reservoirs near Chicken Springs in pasture C; 1 reservoir in Long Draw south of Zembo Reservoir in pasture B; 1 reservoir at T. 30 N., R. 105 W., Section 35 of pasture B; and 1 reservoir south of Muddy Ridge in pasture A.
13005	I	Poston	nothing listed
13006	M	Reservoir	nothing listed
13007	I	Pacific Creek	1) Buffalo Hump - new well proposed - T. 24 N., R. 105 W., area of Section 15 2) Tule Butte - new well proposed - T. 25 N., R. 104 W., area of Section 22 3) Propose to reconstruct all existing reservoirs and wells.
13008	M	Bar-X	None
13009	I	Fish Creek	Fence reconstruction - 10.2 miles. See Pine Creek Summary.

PROPOSED ALLOTMENT PROJECTS (Continued)

Allotment		Allotment Name	Proposed Projects[1]
Number	Category		
13010	I	Pine Creek	Fence reconstruction: Sweetwater Drift Fence Boundary between Pine Creek and Fish Creek Allotments T. 28 N., R. 100 W., to begin in Section 29 at the Sweetwater River extending 10.2 miles of fence replacement along boundary between these allotments.
13011	I	Continental Peak	District Boundary Fence: 7 ½ miles of fence to be reconstructed and maintained. T. 28 N., R. 99 W., Section 28.
13012	I	Red Desert	None
13013	I	Bush Rim	None
13014	I	Steamboat Mountain	None
03016	I	Fourth of July	
13015	I	Sands	None
13017	I	Eighteen Mile	
13018	M	Rock Springs	Wild horse projects for water to obtain distribution: Total 15 reservoirs: - Ts. 16-18 N., Rs. 99-104 W. (5 reservoirs on public land) - Ts. 21-22 N., Rs. 99-100 W. (5 reservoirs on public land) - Ts. 21-22 N., Rs. 105-106 W. (5 reservoirs on public land)
13019	M	Sandy Pasture	None
13020	M	Buckskin Sandy	None
13021	C	Mack Flat	Custodial
13022	I	Lombard	None
13023	I	Figure Four	None
13024	M	Big Sandy	None
13026	I	Boundary	None
13027	I	Sublette	Develop one well at T. 27 N., R. 108 W., NW¼SE¼ Section 2 Develop one reservoir at T. 27 N., R. 108 W., SE¼NW¼ Section 5.

APPENDIX 9-4

PROPOSED ALLOTMENT PROJECTS (Continued)

Allotment			
Number	Category	Allotment Name	Proposed Projects[1]
13100	C	Jack Ranch	Custodial
13101	C	Upper White Acorn	Custodial
13102	C	McCann Ranch	Custodial
13103	C	Eaton Ranch	Custodial
13104	C	Long Draw	Custodial
13105	C	Erramouspe Ranch	Custodial
13106	C	Dewey Place	Custodial
13107	C	Middle Hay Place	Custodial
13109	C	Sweetwater	Custodial
13110	C	Dead Ox	Custodial
13114	C	Chilton Place	Custodial
13115	C	Houghton Ranch	Custodial

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[1] This includes both AMP and non-AMP projects.

APPENDIX 9-5

STANDARD OPERATING PROCEDURES FOR RANGE IMPROVEMENTS AND VEGETATION MANIPULATIONS

These operating procedures provide standard guidance for all range improvements and vegetation manipulations.

Consultation with the affected interest groups and an approved environmental analysis would be required for all range improvements before any project is constructed.

Roads or trails to new construction or project sites would be constructed only if access does not exist.

Proposed range improvements that would result in surface disturbance would be inventoried for archeological features. All archeological sites identified would be avoided or mitigated. If undiscovered cultural remains are encountered during construction, the operator would temporarily discontinue activities until BLM evaluates the discovery and determines the appropriate action.

Proposed range improvements resulting in surface disturbance would be subject to these guidelines.

No action would be taken by BLM that could jeopardize the continued existence of any federally listed threatened or endangered plant or animal species.

BLM would also comply with any state laws applying to animal or plant species identified by the state as being threatened or endangered (in addition to the federally listed species).

Wildlife escape devices would be installed and maintained in all water troughs.

An analysis of cost effectiveness would be completed on an allotment basis prior to the installation of any management facilities or land treatments funded by the BLM.

Fences in pronghorn antelope winter ranges, deer crucial winter ranges, and known migration routes would be constructed to minimal standards (3-strand wire fence with bottom wire smooth and top two barbed), monitored annually, and modified if necessary to facilitate reasonable movement by wildlife.

All areas where vegetation manipulation occurs would be totally rested from livestock grazing for a period necessary to allow for the recovery and re-establishment of key forage species.

Chemical treatment would consist of applying approved chemicals to meet plan objectives. Before chemicals are applied, the BLM would comply with Department of Interior regulations. All chemical applications would be preceded by an approved pesticide use proposal and an environmental assessment. All applications would be carried out in compliance with the pesticide laws for Wyoming.

All land treatment projects on crucial wildlife ranges will be limited in size, where necessary, by the cover and(or) forage requirements of wildlife. Proper mitigation measures would be incorporated.

All burning projects will have a burn plan, environmental assessment, and a burn permit from the State of Wyoming's Department of Environmental Quality prior to initiation.

The impacts on wildlife winter range areas and on wild horse distribution would be considered in planning all new water facilities.

On identified crucial deer winter ranges where vegetative manipulation is planned or other vegetative disturbance has occurred, include a variety of high quality shrub seedlings, such as winterfat, shadscale, four-wing saltbush and, in certain instances mountain mahogany and antelope bitterbrush, to complement the usual grass mixture.

Exclusion of wildlife and livestock and possible reseeding operation may be required in severe unstable watersheds.

All vegetation treatments will be designed irregular in shape for edge effect, cover, and visual esthetics.

No more than 10 percent of the sagebrush within pronghorn antelope winter ranges would be treated within a 10-year period. Treatment areas would be irregular in shape.

Treatment units within VRM Class II areas would not exceed 40 acres in size, nor more than 10 percent of the area would be treated within a 10-year period, and treatment areas would be irregular in shape.

No more than 20 percent of the sagebrush within 2 miles of sage grouse strutting grounds would be treated within a 10-year period. All treatments would be irregular in shape.

Design of Range Improvements

All range improvements will be designed and constructed in such a manner so as to minimize environmental impacts while maximizing function and cost effectiveness. Prior to the installation of any range improvements, an environmental ssessment (EA) will be prepared analyzing the alternatives for the project. In addition, a benefit/cost analysis (B/C) will be completed, if government funding is involved, to determine the cost effectiveness of the project.

Brush Control

Brush control refers to the removal of a shrub or tree overstory to release the grass and forb understory from the effects of competition for soil nutrients and water. The techniques involved in brush control generally fall into one of three categories: burning, chemical, or mechanical.

Burning involves the use of fire under prescribed conditions to change the character of the vegetative community. This technique takes advantage of the relative fire tolerance between plant species. Prescribed burning is most useful in removing a dominant fire sensitive overstory species, such as big sagebrush, thereby opening up the community to the natural response of fire tolerant grasses, forbs and shrubs. Prescribed fire can also be useful in preparing a seedbed for artificial reseeding. The main disadvantage to prescribed burning is its harsh initial impact on the site. Initially, ground cover is greatly reduced, erosion potential is increased, wildlife habitat is reduced and forage production is decreased. Re-establishment of vegetation on the site can be quite slow but usually results in increased productivity, palatability and species diversity while erosion potential is decreased over pretreatment levels. The cost of prescribed burning is low compared to other techniques.

Chemical treatments involve the use of ground or aerially applied herbicides to target species to reduce their competitive effect on more desirable species. Many classes of herbicides exist and they all vary in action, selectivity, and persistence. However, relatively few compounds are approved for use in brush removal on public lands. These compounds are usually selective for broadleaf vegetation and leave only grasses and tolerant forb and shrub species after treatment. If, for instance, the target species is sagebrush, few species other than grasses will exist immediately following application. However, by the next growing season the seed source for other species will begin to express itself as a result of reduced overstory competition. Generally by the end of the first complete growing season, increased understory productivity and species diversity are evident. Chemical treatments have less total impact on the site than burning or mechanical treatments but are usually more expensive than burning. In addition, the seedbed resulting from a chemical treatment is usually not as suitable for reseeding due to the amount of standing litter.

Mechanical treatments involve the use of agricultural equipment to simply remove the overstory or to consume the entire community and leave a suitable seedbed. Techniques and implements are highly variable but all share the disadvantage of high cost.

All of the above brush control techniques can be used to prepare a seedbed suitable for artificial reseeding. Where needed, reseeding is a viable technique to establish a more desirable plant community. However, seed and application costs can be high and are sometimes difficult to prove cost effective. Wherever possible, techniques used and sites chosen on the resource area will be those that lend themselves to natural regeneration.

Vegetation manipulation (controlled burning, mechanical treatment, artificial seeding, etc.) will generally be designed in irregular patterns creating more "edges," with islands of vegetation left intact for cover, with the exception of drainages where active channel incision is occurring or in areas where saline or sodic soils are present. Manipulation proposals are handled on a case-by-case basis, followed with animal control to ensure re-establishment of vegetation.

Reservoirs

Reservoirs are constructed by heavy earth-moving equipment that is used to build dikes across drainages. The impoundments created are designed to catch temporary runoff or permanent streamflow to provide a more reliable source of water for livestock and wildlife. Design requirements are determined mainly by the nature and amount of source water. Upstream fencing is sometimes desirable to provide riparian habitat and reduce the silt load entering the reservoir.

Water will be provided for wildlife in appropriate habitat areas (spring/summer/fall habitat areas). Whenever possible, water will be provided in allotments (including rested pastures) during seasonal periods of need for wildlife.

Wells

Wells are usually drilled in areas where other water sources are unavailable to provide a reliable water source for livestock and wildlife. Drinking troughs will be installed near the well and will be modified to serve young and mature animals as well as small game and birds. Well sites will be selected based on geologic well site investigations.

Springs

Spring sources are usually developed with a backhoe or other implement designed to expose the aquifer. Source points are gathered into a central point or head box through a perforated pipe and diverted into a pipeline or drinking trough. The spring source will be fenced for protection and to provide riparian habitat. A wildlife drinking trough may be located within the enclosure. The livestock trough will be located outside the enclosure and will also be modified for use by wildlife.

Pipelines

Pipelines consist of plastic, usually polyethylene, pipe buried by mechanical pipe laying implements to a depth necessary to maximize the life and efficiency of the pipe material. Pipelines originate at spring sources or wells and are used to distribute water to unserviced areas. Drinking troughs are situated along the pipeline, usually no more than one mile apart, to distribute use throughout the area.

Fences

Fences are constructed to provide management boundaries such as to provide pastures or outside boundaries for a grazing allotment. Because of the potential for impact to wildlife movement, fence design is highly variable. Wire would be smooth, barbed, mesh, or combined, dependent on the wildlife species involved. Steel line posts will be spaced a minimum of 16.5 feet apart. Wooden braces will usually be spaced one-quarter mile apart. Fences may be modified in heavy snow or animal migration areas by using wood poles.

Cattleguards

Cattleguards will be installed where fences cross heavily traveled roads or in situations where opened gates would severely compromise management. Cattleguard grids vary in weight and size requirements, but usually require a backhoe to install.

Noxious Weed Guidelines

Chemical treatment by spray application within 100 feet of perennial streams would be prohibited. If riparian vegetation exceeds 100 feet, this buffer would be expanded to make certain this vegetation is not destroyed. Noxious weeds may be treated in accordance with the Rock Springs District Noxious Weed EA (WY-049-EA82-64) and Northwest Area Noxious Weed Control Program EIS.

The County Weed and Pest Supervisors will consult with the BLM Authorized Officer prior to initiation of any site-specific treatment projects.

The County Weed and Pest Supervisor with the BLM Rock Springs District will develop a water monitoring plan for any riparian treatment area prior to chemical applications. For management purposes, riparian habitat is the on-site vegetation found immediately adjacent and subject to the influences of surface and subsurface waters from streams, rivers, or standing bodies of water.

Monitoring

All chemical treatment sites will be re-evaluated by the County Weed and Pest Supervisors and the BLM Authorized Officer one and two years, respectively, after treatment to ascertain the effectiveness of the treatment program. If re-treatment is necessary, County Weed and Pest Supervisors in cooperation with the BLM Rock Springs District will develop a re-treatment program.

Aerial Application

All aerial application, particularly near live water (ponds or lakes), would require the direct consultation and approval of an Authorized Officer of the Rock Springs District prior to the action. An unsprayed buffer zone of 100 feet will be maintained near live or still water. Spray areas will be irregular in shape.

Vehicular Mounted Boom Sprayers and Hand Spray Gun

Vehicular mounted boom sprayers and hand spray guns would mostly be used in nonriparian zones, accessible by vehicle. Near live or still water areas, the spray boom would only be used where feasible. With both methods, sprays would be applied at a height of 1.5 to 2 feet when wind velocity is below 7 mph, except in riparian areas where treatment would only be conducted when wind velocity is below 4 mph.

Wipe Application Method for Liquid Formulations

Wipe application would be used near live water and other aquatic sites, particularly environmentally sensitive areas, and where weeds overhang waterways. The herbicide solution would be wiped on the individual plants to be controlled. All herbicide application near water areas described in Appendix 12 of the Designated Noxious Weed Control EA would require consultation and approval by the BLM Authorized Officer prior to initiation of treatment. A buffer zone or distance designated by the BLM Authorized Officer after consultation with the appropriate County Weed and Pest Supervisor would be maintained near these waters.

Chemical spraying in riparian areas will not be allowed without prior approval of the authorized officer. All spraying will follow guidelines in appropriate BLM Manuals.

As an ongoing part of the program, the BLM will consider the re-invasion of noxious weeds in the design and implementation of grazing systems.

Chemical treatment and applications will be used only where national guidelines and demonstrated protection can be exercised to prevent unwanted destruction of desirable fauna or flora and to prevent transportation of these chemicals to other areas by water or air movement. Edge effect will be maximized by following natural contours and terrain features.

Grazing of treated areas would be deferred for at least two growing seasons.

Allow no surface-disturbing construction of range improvements if high seasonal soil moisture would result in excessive rutting of roads, etc. The period from March 15 to May 1 is typically unsuitable for surface-disturbing activity.

Prescribed Burn Treatment Guidelines

Vegetation treatment (fire, chemical, mechanical, biological) to remove decadent brush or alter existing vegetation will be considered to meet RMP objectives.

Prescribed fire will generally be the preferred method of vegetation manipulation to convert decadent stands of brushland to grasslands and to stimulate sprouting of old, decadent aspen stands and/or shrub species. Prescribed burns are preferred in areas having greater than 35 percent sagebrush composition, 20 percent desirable grass composition, and greater than 10 inches of precipitation. Other vegetation manipulation methods will be considered on a case-by-case basis depending on objectives and cost benefits.

Prescribed burns would be conducted in crucial antelope and mule deer winter ranges or sage grouse nesting areas only if habitat values would improve for these species. A site specific analysis would be conducted prior to any treaments. Areas with a significant amount of antelope bitterbrush (*Purshia tridentata*) will be examined and evaluated before prescribed burns are conducted. Burns will be conducted in conditions that support the objective. Edge effect will be maximized by burning in a mosaic pattern whenever possible. Unplanned fires that occur in areas with an approved fire prescription will be allowed to burn as long as they remain within the prescriptions and meet land use objectives. Individual, decadent aspen stands may be burned to promote sprouting and encourage regeneration. Each planned burn will be evaluated and examined in relation to multiple use objectives.

Each alternative has identified the number of acres suitable for prescribed fire to increase forage production. The acreage figures in Appendix 9-7 were derived from computer-generated data (Geographic Information System and satellite imagery) which overlayed precipitation zones, crucial wildlife ranges, and areas with greater than 35 percent brush canopy. Development of AMPs and other activity plans will further refine the acreage according to livestock grazing, wildlife, and other resource objectives. Some allotments have very small acreages available for prescribed burns. Because of the high cost to burn such small areas, they are not likely to be treated. Other allotments containing large acreages may not receive the total projected burn acreage due to resource considerations (e.g., sage grouse nesting areas, erodible soils, or other factors). Acreages of prescribed burns may increase or decrease on certain allotments depending on rangeland management needs as addressed in AMPs and other activity plans.

Chemical Treatment Guidelines

Chemical treatment and applications will be used only where control can be exercised to prevent unwanted destruction of desirable flora or fauna and to prevent transportation of chemicals to other areas by water or air movement. Specific methods of application would be used for the control of noxious weeds and the reduction of sagebrush canopies that have increased to undesirable levels. Sagebrush control areas will be limited to a maximum size of 160 acres. Edge effect will be maximized by following natural contours and terrain features.

Wipe application methods may be used along the streams that are Colorado River trout habitat and in the special habitat improvement program areas in the planning area provided no adverse impacts occur to these resources.

Method of control of designated noxious weeds near threatened and endangered plant sightings will be determined by the BLM.

Biological treatment (insects) will be considered to weaken and limit reproduction of noxious weeds in critical riparian areas or areas with sensitive plants and animals where application of chemicals is not feasible. Any insects used for noxious weed control must have been carefully tested for host specificity, thus reducing or eliminating possible adverse effects on native vegetation.

Mechanical Treatment Guidelines

Mechanical vegetation treatment (chaining, ripping, pitting, etc.) will be considered to alter existing vegetation. Mechanical treatments will be examined on an individual basis in relation to multiple use objectives.

All brush control projects will involve site specific environmental analysis; coordination with affected livestock operators and the WGFD; and will consider objectives for other resource uses including livestock, wildlife, and watershed.

APPENDIX 9-6

IMPLEMENTATION OF GRAZING USE

Allotment Number	Allotment Name	Public Land (AC)	Decision or Active Preference	Agreement Date	Season of Use	Grazing System		5-Year Use (AUMS)	Comments
						Implemented EIS/RPS Proposed	Implemented and/or Decision		
03000	Gold Creek	20,411	2,501	AMP-1983*	S, F	4PAG	4PRR	2,216	
03016	Fourth of July	9,791	836	AMP-1979	Sp,S,F,W	DR	840		AMP-use not yearlong
03028	Eden Project	27,664	2,870	DMD-1985	Sp, S, F	None	None	2,365	Taken back from BOR in 1985
03202	Juel Place	2,281	301	ROD-1979	S	NS		301	
03203	Spicer Group	345	29	ROD-1979	S	NS		29	
03204	Grass Creek	1,773	220	ROD-1979	S, F	NS		220	
03206	Pulley Place	113	2	ROD-1979	S	NS		2	
03207	Pacific Springs	271	29	ROD-1979		NS		29	
03214	Johnson Place	54	10	ROD-1979	Sp, S	NS		10	
03215	Cookston Ranch	79	4	ROD-1979	S	NS		4	
03303	Jenson Meadows	959	97	ROD-1979	S, F	NS		97	
03304	Big Sandy Ranch	210	20	ROD-1979		NS		20	
03307	Hay Meadow	80	91	ROD-1979		NS		89	
03404	Richie Pasture	17	6	ROD-1979	S	NS		6	
04001	Circle Springs	8,875	946	ROD-1983	Sp,S,F,W	SSR		488	Allotment -use not yearlong
04002	Rife	21,783	1,458	GP-1988	Sp, S, F	NS	2PDR	758	Grazing plan for livestock conv.
04003	Vermillion Creek	139,551	12,409	AMP-1986	Yearlong	DSG	NC	10,000	
04004	Alkali Creek	26,855	2,283	ROD-1983	Sp, F	NS		873	
04005	Crooked Wash	10,953	2,292	ROD-1983	W	DR		1,145	AMP not implemented yet
04006	Horseshoe Wash	7,086	607	ROD-1983	W	DR		302	AMP not implemented yet
04007	Pine Mountain	60,961	7,763	AMP-1988	Sp,S,F,W	SSR	3PDR	3,515	AMP-use not yearlong
04008	Red Creek	53,380	3,932	AMP-1984	Sp, S, F	3PRR	4PRR	2,084	
04009	Salt Wells	43,075	2,618	AMP-1985	Sp, S, F	SSR	3PDR	2,128	
04010	Sugarloaf	75,940	5,223	ROD-1983	Yearlong	SSR		3,184	AMP-not implemented yet
04011	Spring Creek	36,917	4,070	AMP-1986	Yearlong	3PRR	4PDR	3,443	
04012	Henrys Fork	306,143	30,358	AMP-1978*	Yearlong	2PDR	NC	25,873	6 pastures, 2 have winter use
04013	Hickey Mountain	6,566	678	ROD-1983	Sp, S, F	DR		678	AMP not implemented yet
04014	Larsen	1,036	112	ROD-1983	S, F	NS		112	
04015	Stag Hollow	1,889	378	ROD-1983	Sp, S, F	NS		378	
04016	Donohoo	945	176	AMP-1985*	S	2PDR	NC	176	
04017	Poison Creek	699	134	ROD-1983	Sp, S	NS		134	
04018	Bald Hills	5,087	925	ROD-1983	Sp, S, F	DR		847	AMP not implemented yet
04019	Hanks	3,393	593	ROD-1983	Sp, S	DR		593	AMP not implemented yet
04020	Hisey Hollow	865	71	ROD-1983	Sp, S	NS		71	
04021	Cedar Point	1,440	162	ROD-1983	Sp, S	NS		162	
04022	Antelope	7,847	461	ROD-1983	Sp, S	2PDR		426	AMP not implemented yet
04023	Circle Bar	646	120	ROD-1983	F	NS		120	
04024	Sage	2,410	209	ROD-1983	Sp, S	NS		208	
04025	Cottonwood Creek	4,557	436	ROD-1983	Sp,S,F,W	2PDR		436	Allotment -use not yearlong
04026	Peoples Canal	1,235	50	ROD-1983	Sp, S	NS		51	
04027	Mellor Mountain	62,046	6,101	ROD-1983	Sp, S, F	SSR		3,148	AMP - not implemented yet
013001	White Acorn	41,722	3,382	AMP-1980	Sp, S, F	2PAG & 3PRR	3PDR & 2PRR	2,964	
13002	Little Prospect	77,078	6,009	AMP-1981	Sp, S, F	2PAG & 3PRR	3PDR & 1PRR	3,859	
13003	Little Sandy	99,981	7,753	AMP-1982*	Sp, S, F	2PAG & 3PRR	4PDR	6,135	Bor 3164 Ac

IMPLEMENTATION OF GRAZING USE (Continued)

Allotment Number	Allotment Name	Public Land (AC)	Decision or Active Preference	Agreement Date	Season of Use	Grazing System: Implemented EIS/RPS Proposed	Grazing System: Implementee and/or Decision	5-Year Use (AUMS)	Comments
13004	Prospect Mountain	43,959	4,348	AMP-1983*	Sp, S, F	2PAG & 3PRR	6PDR & SDLI	3,133	
13005	Poston	45,996	3,905	AMP-1981	Sp, S, F	3PRR	3PDR & SDLI	1,901	
13006	Reservoir	18,239	1,960	AMP-1983*	Sp,S,F,W	3PRR	2PDR	1,176	Bor 12,779 Ac, AMP-use not yearlong
13007	Pacific Creek	195,116	9,010	AMP-1985*	Sp,S,F,W	PRR	2PDR	2,309	AMP-use not yearlong
13008	Bar X	4,234	468	AMP-1983*	Sp,S,F,W	3PDR	NC	439	AMP-use not yearlong
13009	Fish Creek	6,416	362	AMP-1984*	Sp, S	2PAG	NC	254	
13010	Pine Creek	16,592	1,344	AMP-1980	Sp, S, F	3PRR	2PDR	1,208	
13011	Continental Peak	81,872	6,384	AMP-1984*	Sp,S,F,W	3PRR	SDLI & HC	3,171	AMP-use not yearlong
13012	Red Desert	243,676	10,596	AMP-1984*	Sp,S,F,W	3PRR	6PDR	1,716	AMP-use not yearlong
13013	Bush Rim	93,038	4,137	AMP-1984*	Sp,S,F,W	3PRR	5PDR	1,136	AMP-use not yearlong
13014	Steamboat Mountain	24,498	948	AMP-1979	Sp,S,F,W	2PDR	NC	851	AMP-use not yearlong
13015	Sands	105,082	4,239	AMP-1983*	Sp,S,F,W	3PRR	3PDR	3,860	AMP-use not yearlong
13017	18-Mile	228,840	18,994	AMP-1983	Sp,S,F,W	3PRR	2PDR	6,900	Bor 14,895 Ac, AMP-use ot yearlong
13018	Rock Springs	956,682	109,442	ROD-1983	Yearlong	NS	NC	52,000	
13019	Sandy Pasture	1,601	180	ROD-1979	Sp, S	NS	NC	134	
13020	Buckskin Sandy	8,508	687	AMP-1983	Sp, S, F	NS	2PDR	191	
13021	Mack Flat	1,108	77	ROD-1979	Sp, S, F	NS		77	
13022	Lombard	21,112	6,643	AMP-1983*	Sp,S,F,W	3PRR	3PDR & SDL	15,800	Bor 73,690 Ac
13023	Figure Four	114,425	6,644	AMP-1980	Sp,S,F,W	3PRR	2PDR	1,969	AMP-use not yearlong
1324	Big Sandy	59,140	4,126	AMP-1981	Sp,S,F,W	3PRR	1PDR	696	Bor 1,732 Ac
13025	Highway-Gasson	82,201	5,208	AMP-1982*	Sp,S,F,W	3PRR	2PDR	3,575	Bor 14,113 Ac, AMP-use not yearlong
13026	Boundry	29,995	2,996	AMP-1981	Sp,S,F,W	3PRR	3PDR & SDLI	1,604	AMP-use not yearlong
13027	Sublette	66,029	6,004	AMP-1983	Sp,S,F,W	3PRR	2PDR	5,358	Bor 2,473 Ac, AMP-use not yearlong
13100	Jack Ranch	100	8	ROD-1979	S, F	NS		4	
13101	Upper White Acorn	37	5	ROD-1979	Sp, S, F	NS		5	
13102	McCann Ranch	16	2	ROD-1979	S	NS		2	
13103	Eaton Place	81	10	ROD-1979	Sp, S, F	NS		10	
13104	Long Draw	2,076	208	ROD-1979	S, F	NS		208	
13105	Erramouspe	1,295	86	ROD-1979	S	NS		86	
13106	Dewey Place	67	9	ROD-1979	S	NS		9	
13107	Middle Hay	298	16	ROD-1979	NS			16	
13109	Sweetwater	170	11	ROD-1979	Sp, S, F	NS		11	
13110	Dead Ox	109	8	ROD-1979	S, F	NS		8	
13114	Chilton Place	144	15	ROD-1979	NS			15	
13115	Houghton	263	11	ROD-1979	NS			11	
Totals		**3,628,024**	**318,647**					**180,362**	

LEGEND:
Pasture rest - rotation - 2PRR
Pasture alternately graze - 4PAG
Pasture deferred rotation - 2PDR
Scheduled systematic rotation - SSR

IMPLEMENTATION OF GRAZING USE (Continued)

LEGEND (Continued):
Rotation with 1 pasture
Rested yearlong
Deferred seasonal grazing (spring) - DSG
Scheduled systematic rotation in traditional use areas - SSRT
Deferred rotation - DR
No system - NS
#Pasture herder controls deferred rotation - HCDR
Short duration, low intensity - SDLI
Herder control - HC
* = AMP revised includes changes for EIS proposal on season of use and grazing system.
ROD = Record of Decision
DMD = District Manager's Decision
AMP = Allotment Management Plan
GP = Grazing Plan
SP = Spring
S = Summer
F = Fall
W = Winter

APPENDIX 9-7

RANGE IMPROVEMENTS

Allotment Name	Number	Project(s)	Year Completed
Big Sandy	13024	One well	1983
Continental Peak	13011	Riparian exclosure (0.63 miles fence); Four reservoirs	1985
Eighteen Mile	13017	One well	1983
Gold Creek	03000	Prescribed burn (1,700 acres); Two fences (7.5 miles)	1983, 1986, 1987
Henry's Fork	04012	Fence (cemetary exclosure, 0.2 miles); One spring; two reservoirs	1987, 1988
Highway Gasson	13025	Seven pits; One pipeline (2 miles); Riparian exclosure (3.6-mile fence)	1983, 1986 1987, 1988
Little Prospect	13002	Prescribed burn (5,000 acres); One reservoir	1985, 1986
Little Sandy	13003	Boundary fence (2 miles)	1984
Poston	13005		
Pacific Creek	13007	Two wildlife guzzlers	1986
Pine Creek	13010	One well	1983
Pine Mountain	04007	Spring & pipeline (8 miles); 10 reservoirs	1988, 1989
Prospect Mountain	13004	Prescribed burn (1,700 acres)	1984, 1985, 1987
Red Creek	04008	Fences (20 miles); Three reservoirs/pits; Prescribed burns (619 acres)	1984, 1985 1986, 1987
Red Desert	13012	Two wells	1983
Rock Springs	13018	Five wildlife guzzlers	1986
Salt Wells	04009	Four reservoirs/pits; Two springs; Boundary fence (4 miles)	1986, 1987
Sandy Pasture	13019	One well	1984
Sugarloaf	04010	One spring	1989
Springs Creek	04011	Prescribed burn (1,300 acres); One reservoir; two springs	1987, 1988
Sublette	13027	One well	1983
Vermillion Creek	04003	Six resevoirs/pits; Two wells; Prescribed burn (9,000 acres)	1986, 1987, 1988
White Acorn	13001	Riparian exclosure (3 miles fence); Prescribed burn (1,200 acres); Four potholes; Three springs	1983, 1985 1987, 1988

APPENDIX 9-8

ALLOTMENT CATEGORIZATION

SELECTIVE MANAGEMENT CRITERIA BY CATEGORY

Individual allotments were categorized based on interviews with permittees, field evaluation by BLM personnel, and identified resource use conflicts. The following criteria were considered during the allotment categorization.

These criteria were used as general guidelines, and as such, may not be totally representative of an entire individual allotment. The categorization is a dynamic process and if conflicts are identifies in M category allotments, they may receive management attention through other resource activity planning (such as wildlife habitat management), or if needed, the category may be changed to I. Funding may be provided for M or C allotment improvements as priorities allow.

Maintenance Category (M)

Present range condition is satisfactory.

Allotments have moderate or high resource production potential and are producing near their potential (or trend is moving that direction).

Present management is considered satisfactory.

Riparian areas are under satisfactory management and are not in a declining trend.

No serious conflicts exist with regard to current uses of resource.

Potential may exist for positive economic returns on public investments.

Improve Category (I)

Present range condition is unsatisfactory or in a declining trend.

Allotments have moderate to high resource production potential but are producing at low to moderate levels.

Present management is considered unsatisfactory.

Riparian areas are presently in a declining trend and management is unsatisfactory.

Serious resource use conflicts may exist and controversy is at a high level.

Potential for high return on public investment exists.

Custodial Category (C)

Present range condition is variable.

Allotments have low resource production potential and are presently producing at or near their potential.

Present management appears satisfactory or is the only logical practice under existing resource conditions.

Riparian areas are either not present, or are not in a declining condition.

Limited resource conflicts and(or) controversy presently exist.

Potential for returns on public investment is low.

SELECTIVE MANAGEMENT CRITERIA BY SITUATION

Range Condition

A professional judgement criteria used when there is a lack of ecological range site data. A subjective rating of what the area is now producing as compared to its potential.

Resource Potential

A professional judgement criteria used to determine the allotment's potential (capability) to improve. This criteria is based on the potential that exists for increased forage production, either naturally or artificially.

High Potential - I
Moderate Potential - M
Low Potential - C or M

Present Management Situation

A rating of allotments based on present range management practices.

Allotment is receiving satisfactory management - M or C

Allotment is receiving unsatisfactory management - I

Riparian Areas

A judgement of whether or not riparian vegetation is declining, static, or in an upward trend.

Declining trend - I
Static or upward trend - M or C

Resource Use Conflicts and(or) Controversy

Critical wildlife habitat areas, wilderness study areas, ACECs, mining or oil and gas, and other conflicts that may exist.

Low level of conflict/controversy - M or C
High level of conflict/controversy - I

Economic Investment Potential

The potential for a positive economic return on investments.

High - I
May exist - M
Low - C

Ranking of Allotments in the Improve Category

The allotments in the improve category were ranked in priority order based upon professional judgement and problems and(or) conflicts. The current priority list is described in Appendix 9-2.

APPENDIX 9-9

RESOURCE MONITORING AND EVALUATION OF ALLOTMENTS AND WILD HORSE HERD MANAGEMENT AREAS

1. Satisfactory grazing management and overall apparent trend is static.

Eden Project	-	03028
Fourth of July	-	13016
Juel Place	-	03202
Boundary	-	13026
Spicer Group	-	03203
Jack Ranch	-	13100
Pulley Place	-	03206
Upper White Acorn	-	13101
Johnson Place	-	03214
McCann Ranch	-	13102
Cookston Ranch	-	03215
Eaton Ranch	-	13103
Hay Meadow	-	03307
Long Draw	-	13104
Crooked Wash	-	04005
Erramouspe Ranch	-	13105
Horseshoe Wash	-	04006
Dewey Place	-	13106
Larson	-	04014
Middle Hay Place	-	13107
Hisey Hollow	-	04020
Dead Ox	-	13110
Fish Creek	-	13009
Chilton Place	-	13114
Steamboat Mountain	-	13014
Houghton Place	-	13115
Sands	-	13015

2. Satisfactory grazing management and overall apparent trend is upward.

Grass Creek	-	03204
Little Prospect	-	13002
Pacific Springs	-	03207
Bar-X	-	13008
Jensen Meadows	-	03303
Continental Peak	-	13011
Big Sandy Ranch	-	03304
Red Desert	-	13012
Stag Hollow	-	04015
Bush Rim	-	13013
Donohoo	-	04016
Buckskin Sandy	-	13020
Poison Creek	-	04017
Mack Flat	-	13021
Peoples Canal	-	04026

2. (Continued)

Big Sandy	-	13024
White Acorn	-	13001

3. Monitoring data is inconclusive as to satisfactory grazing management and apparent trend.

Circle Springs	-	04001
Henry's Fork	-	04012
Rife	-	04002
Mellor Mountain	-	04027
Vermillion Creek	-	04003
Sandy Pasture	-	13019
Spring Creek	-	04011

4. Data indicates grazing management changes are needed to improve riparian area condition.

Gold Creek	-	03000
Antelope Wash	-	04022
Pine Mountain	-	04007
Circle Bar	-	04023
Salt Wells	-	04009
Sage	-	04024
Sugarloaf	-	04010
Cottonwood Creek	-	04025
Hickey Mountain	-	04013
Pine Creek	-	13010
Bald Hills	-	04018
Eighteenmile	-	13017
Hanks	-	04019
Lombard	-	13022
Cedar Point	-	04021
Highway-Gasson	-	13025

5. Data indicates grazing management changes are needed to improve rangeland condition.

Alkali Creek	-	04003
Figure Four	-	13023
Prospect Mountain	-	13004
Sublette	-	13027
Poston	-	13005
Sweetwater	-	13109

6. May need minor revision in grazing management to improve riparian area condition.

Red Creek	-	04008
Rock Springs	-	13018
Little Sandy	-	13003

RESOURCE MONITORING AND EVALUATION OF WILD HORSE HERD MANAGEMENT AREAS

1. Divide Basin Wild Horse Herd Management Plan Area

Recent vegetation inspections show that these grazing allotments appear to be in fair to good condition with much of the vegetation and erosion objectives being met. The overall herd objectives of diverse age, color, sex, and general good health condition have been reached and are being maintained.

2. White Mountain Wild Horse Herd Management Area

The vegetative trend in the Highway Gasson and Lombard Allotments is upward in all key areas while the trend of vegetation on most checkerboard land of the Rock Springs Allotment appears to be static. The White Mountain wild horse herd is healthy and viable and all severely crippled and deformed animals are gathered. Although not stated in the management plan, this herd has been managed to promote or increase horses with paint and appaloosa coloring.

3. Desert Common/Figure 4 Wild Horse Herd Management Area Plan

The vegetative trend of all key species is down in the western third of the allotment. Key areas in the eastern portion of the allotment are exhibiting a slightly upward or static trend. The trend of riparian communities along the Green River appears to be static or downward. Wild horses are not causing resource damage because they are rarely present in the allotment. There is currently very little opportunity to manage sex, color, and age classes of wild horses in the Figure 4 Allotment.

4. Adobe Town Wild Horse Herd Management Area

Range condition in the Green River Resource Area portion of the Adobe Town WHMA appears to be stable and in good condition. Herd populations within the planning area portion have been maintained at or near the desired levels.

5. Salt Wells Creek Wild Horse Herd Management Area

Range conditions appear to be static in most areas that are affected by wild horse populations, but some areas that have seen consistent concentrations of wild horses during the growing season, appear to have experienced diminishing plant vigor and composition. Herd populations have remained at or near objective levels since institution of wild horse gathering.

APPENDIX 9-10

RESOURCE CONFLICTS/POTENTIAL CONFLICTS IN ALLOTMENTS

Allotment Name	Allotment Number	Specific Conflict/Problem
I Category Allotments		
Gold Creek	3001	1,2,3,4,5,6,7
Circle Springs	04001	1,2,4,6,8,9,10
Vermillion Creek	04003	2,3,8,10,11,12,13
Alkali Creek	04004	1,10,12,13
Crooked Wash	04005	12,13
Horseshoe Wash	04006	12,13
Pine Mountain	04007	1,2,3,6,7,12,14,15,16,17,18,19
Red Creek	04008	1,2,3,4,6,7,8,12,18,19,20
Salt Wells	04009	1,2,6,8,10,19
Sugarloaf	04010	1,2,4,7,8,12,17,18
Spring Creek	04011	1,2,4,8,12
Henry's Fork	04012	1,2,6,7,8,12,13,18,20
Hickey Mountain	04013	1,4,7,8,18,21
Bald Hills	04018	1,8
Hanks	04019	1,2,6,8
Antelope Wash	04022	1,2,5,8
Circle Bar	04023	1,2,5,8,22
Sage	04024	1,2,5,8,22
Cottonwood Creek	04025	1,2,5,8,22
Mellor Mountain	04027	1,2,10,14,15,16
Little Sandy	13003	1,2,7,8,9,23
Prospect Mountain	13004	1,2,3,5,7,8,12,14,15,23,25
Poston	13005	1,2,7,8,16,26,27
Fish Creek	13009	1,2,4,5,7,14,26
Pine Creek	13010	1,2,3,7,9,15,23
Steamboat	13014	1,2,7,15,16,17
Sands	13015	7,17,15,16,20,21,28
Fourth of July	13016	7,15,16
18 Mile	13017	1,2,7,10,12,21,29
Lombard	13022	1,2,3,5,7,10,21,29
Figure Four	13023	1,2,8,10,12,21
Highway Gasson	13025	1,2,3,7,10,12,21,26,29,30
Sublette	13027	10,16,31
Sweetwater	13109	1,31
M Category Allotments		
Rife	04002	1,2,10
Larson	04014	4
Stag Hollow	04015	8
White Acorn	13001	1,2,5,7,8
Little Prospect	13002	1,2,4,5,7,8,9,26
Reservoir	13006	1,2,7,8,12,29,33
Pacific Creek	13007	1,2,7,12,17,26,29
Bar X	13008	1,2,5,8
Continental Peak	13011	1,2,5,7,9,10,14,15,20
Red Desert	13012	1,2,4,7,8,10,16,20
Bush Rim	13013	1,2,4,7,10,20
Rock Springs	13018	1,7,8,10,12,20,21,29,32
Sandy Pasture	13019	4,5,8
Buckskin Sandy	13020	1,5
Big Sandy	13024	1,12,26,29
Boundary	13026	8,16,26

APPENDIX 9-10

RESOURCE CONFLICTS/POTENTIAL CONFLICTS IN ALLOTMENTS (Continued)

Allotment Name	Allotment Number	Specific Conflict/Problem
C Category Allotments		
Juel Place	03202	1
Spicer Group	03203	34
Grass Creek	03204	1,35
Pulley Place	03206	2,29,35
Pacific Springs	03207	1
Johnson Place	03214	1
Crookston Ranch	03215	7,34
Jensen Meadows	03303	1,7
Big Sandy Ranch	03304	1,3,7,35
Hay Meadow	03307	1,7,35
Richie Pasture	03404	35
Donohoo	04016	35
Poison Creek	04017	36
Hisey Hollow	04020	5,8,26
Cedar Point	04021	1,35
Peoples Canal	04026	5,8
Mack Flat	13021	35
Jack Ranch	13100	1,35
Upper White Acorn	13101	35
McCann Ranch	13102	7
Eaton Ranch	13103	29,35
Long Draw	13104	35
Erramouspe Ranch	13105	1
Dewey Place	13106	1,35
Middle Hay Place	13107	35
Dead Ox	13110	1
Chilton Place	13114	1
Houghton Ranch	13115	7,34
Eden Farson		1,2,3,18,29,35

Key to Appendix

Number in Table	Specific Conflict/Problem	Number in Table	Specific Conflict/Problem
1.	Riparian areas present	19.	ACEC
2.	Important watershed	20.	Wilderness areas
3.	Fishery present	21.	Oil and Gas
4.	Crucial elk winter range	22.	Noxious and poisonous plants
5.	Crucial moose winter range	23.	Yearlong moose range
6.	Salting stations	25.	Range condition
7.	Recreation use	26.	Sage Grouse leks
8.	Crucial deer winter range	27.	Antelope migration route
9.	Summer antelope range	28.	Coal bed methane
10.	Wild horse range	29.	Bureau of Reclamation lands present
11.	Heavy winter utilization	30.	Trona activity
12.	Crucial antelope winter range	31.	Heavy upland utilization
13.	Supplemental feeding taking place	32.	Coal production
14.	Year round deer range	33.	Important waterfowl area
15.	Year round elk range	34.	Minor soil problems
16.	Year round antelope range	35.	Wildlife area
17.	Elk calving areas		
18.	Threatened or endangered species		

APPENDIX 10

SOCIOECONOMIC TABLES

TABLE A10-1

ANNUAL VISITOR USE AND RELATED EXPENDITURES

Subject	Number of Recreation Days[1]	$ Value/Day	Total $ Value
Hunting	54,792		$4,670,869
Fishing	4,000	40.65	162,600
Boating	400	32.00	12,800
Other Water-Based	1,542	32.00	49,344
ORV Travel	2,292	32.00	73,344
Other Motorized	2,083	32.00	66,656
Snowmobiling	2,917	32.00	93,344
Other Winter Sports	500	32.00	16,000
Non-Motorized Travel	3,208	32.00	102,656
Camping	4,208	32.00	134,656
Site-Based Recreation	1,375	32.00	44,000
TOTAL	77,317		$5,426,269

[1] Source: Resource Area RMA count for all but hunting. Hunting information was derived from Wyoming Game and Fish Department annual harvest reports. In this analysis, a recreation day is a 24-hour period in which the participant engaged in the specific recreational activity of part, or all, of the period. Since the BLM uses a 12-hour day to measure non-consumptive recreation and the WGFD regards any 24-hour period in which recreation occurred as a recreation day, it is difficult to compare/combine consumptive and non-consumptive data for an analysis such as this. The non-consumptive activities tend to be undervalued, resulting in less value for the total recreational sector as well as less comparative value for non-consumptive when measured against consumptive recreational activities. Therefore, while this is the best approximation that can be made of the direct contribution of recreation to the area economy, it is only an approximation.

TABLE A10-2

TOTAL POPULATION: PAST, PRESENT, PROJECTED

Year	Wyoming	Individual Counties					Total of Counties	Counties as % of All Wyoming
		Fremont	Lincoln	Sublette	Sweetwater	Uinta		
1980	469,557	38,992	12,177	4,548	41,723	13,021	110,461	23.52451
1981	490,046	38,907	12,866	4,622	45,008	16,751	118,154	24.1108
1982	497,297	39,636	13,216	4,973	45,068	19,312	122,205	24.57385
1983	498,175	40,359	13,527	5,032	41,952	20,447	121,317	24.35229
1984	500,943	39,900	14,687	5,081	40,901	21,114	121,683	24.29079
1985	504,740	37,512	17,730	7,080	43,730	21,594	127,646	25.28946
1986	492,191	36,026	18,121	7,246	44,467	21,560	127,420	25.88832
1987	475,191	35,887	14,083	4,941	41,946	20,910	117,767	24.78309
1988	477,097	36,300	14,356	4,969	42,007	20,850	118,482	24.83394
1989	480,012	36,798	14,361	4,994	42,347	20,791	119,291	24.85167
1990	482,851	37,235	14,405	5,112	42,608	20,750	120,110	24.87517
1991	486,386	37,707	14,244	5,361	42,782	20,814	120,908	24.85845
1992	489,965	38,099	14,312	5,397	42,942	20,897	121,647	24.82769
1993	493,326	38,341	14,402	5,434	43,076	21,034	122,287	24.78827
1994	496,737	38,533	14,500	5,467	43,198	21,184	122,882	24.73784
1995	499,851	38,674	14,621	5,498	43,336	21,306	123,435	24.69436
1996	502,317	38,713	14,693	5,529	43,294	21,357	123,586	24.60319
1997	504,836	38,716	14,782	5,560	43,232	21,449	123,739	24.51073
1998	507,341	38,679	14,854	5,591	43,172	21,577	123,873	24.41612

Sources: Wyoming Data Handbook, 9th Edition, 1989, by Division of Research and Statistics, Dept. of Administration and Fiscal Control, State of Wyoming.

Wyoming Annual Planning Report 1989, Employment Security Commission of Wyoming, Research and Analysis Section, Casper, Wyoming.

TABLE A10-3

IN LIEU TAX PAYMENTS TO LOCAL GOVERNMENT UNITS: FY88

County	Entitlement Acres: Total (Number)	Entitlement Acres: BLM (Number)	% BLM Is of Total Entitlement Land	Entitlement Acres: FS (Number)	% FS Is of Total Entitlement Land	Entitlement Acres: Other (Number)	% Other Is of Total Entitlement Land[1]	Prior Year Payments ($)[2]	Estimated Payment to County ($)[2]
Fremont	3,214,145	2,085,845	65	980,917	31	147,383	5	48,363	811,887
Lincoln	1,945,720	1,014,195	52	901,027	46	30,498	2	93,482	356,518
Sublette	2,432,412	1,257,529	52	1,169,370	48	5,513	0	93,639	243,241
Sweetwater	4,510,587	4,307,612	96	93,276	2	109,699	2	5,831	950,419
Uinta	566,797	529,035	93	37,762	7	0	0	7,128	417,970
Regional Total	12,669,661	9,194,216	73	3,182,352	25	293,093	2	248,443	2,780,035
State Total	29,872,892	17,522,403	59	9,249,750	31	3,100,739	10	1,340,676	7,756,783
Region As % of State Total	42	52		34		9		19	36

[1] Zero designates a number that is less than one and is too small to be rounded to one.

[2] Total from all sources.

Source: PAYMENTS IN LIEU OF TAXES: FISCAL YEAR 1988, by Division of Finance, U.S. Dept. of the Interior, BLM, Washington, D.C.

TABLE A10-4

TRONA OUTPUT AND VALUATION OVER TIME
(ALTERNATIVE A)

Year	Output of Trona millions tons[1]	Soda Ash Output millions tons[2]	Value/Ton of Soda Ash[2]	$ Value of Soda Ash millions
1989	5	2.75	93.00	255.75
1990	5	2.75	93.00	255.75
1991	5	2.75	95.13	261.61
1992	5	2.75	97.89	269.20
1993	5	2.75	100.98	277.70
1994	5	2.75	104.33	286.91
1995	5	2.75	108.04	297.11
1996	5	2.75	111.90	307.73
1997	5	2.75	115.91	318.75
1999	5	2.75	120.05	330.14
1999	5	2.75	124.36	341.99
2000	5	2.75	128.82	354.26
2001	5	2.75	133.45[3]	366.99
2002	5	2.75	133.45	366.99
2003	5	2.75	133.45	366.99
2004	5	2.75	133.45	366.99
2005	5	2.75	133.45	366.99
2006	5	2.75	133.45	366.99
2007	5	2.75	133.45	366.99
2008	5	2.75	133.45	366.99
2009	5	2.75	133.45	366.99
2010	5	2.75	133.45	366.99
TOTAL	110	60.5		7,226.75

[1] Source: BLM, Rock Springs District and Green River Resource Area Specialists

[2] Source: State of Wyoming, Dept. of Administration and Fiscal Control, June, 1991. DAFC provided a .55 factor for converting trona to soda ash. This has been used here.

[3] No price estimates were provided by DAFC beyond this year; so $133.45/ton was applied to subsequent years through 2010.

TABLE A10-5

TRONA OUTPUT AND VALUATION OVER TIME (PREFERRED ALTERNATIVE, ALTERNATIVES B & C)

Year	Output of Trona (millions tons)[1]	Soda Ash Output (millions tons)[2]	Value/Ton of Soda Ash ($)[2]	Value of Soda Ash (million $)	Resulting Economic Output (million $)[4]
1990	5	2.75	93.00	255.75	459.11
1991	5	2.75	95.13	261.61	469.62
1992	5	2.75	97.89	269.28	483.25
1993	5	2.75	100.98	277.70	498.50
1994	5	2.75	104.33	286.91	515.04
1995	6	3.30	108.04	356.53	640.03
1996	6	3.30	111.90	369.27	662.89
1997	6	3.30	115.91	382.50	686.65
1998	6	3.30	120.05	396.17	711.17
1999	6	3.30	124.36	410.39	736.71
2000	6	3.30	128.82	425.11	763.13
2001	6	3.30	133.45[3]	440.39	790.55
2002	6	3.30	133.45	440.39	790.55
2003	6	3.30	133.45	440.39	790.55
2004	6	3.30	133.45	440.39	790.55
2005	6	3.30	133.45	440.39	790.55
2006	6	3.30	133.45	440.39	790.55
2007	6	3.30	133.45	440.39	790.55
2008	6	3.30	133.45	440.39	790.55
2009	6	3.30	133.45	440.39	790.55
2010	6	3.30	133.45	440.39	790.55
TOTAL: 20 Years	115	63.25		7,779.80	13,965.87

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[1] Source: BLM, Rock Springs District and Green River Resource Area Specialists.

[2] Source: State of Wyoming, Dept. of Administration and Fiscal Control, June, 1991. DAFC provided a .55 factor for converting trona to soda ash. This has been used here.

[3] No price estimates were provided by DAFC beyond this year; so, $133.45/ton was applied to subsequent years through 2010.

[4] The direct, indirect, and induced economic output calculated in this column is the result of multiplying the value of soda ash listed in the previous column by a minerals output multiplier of 1.795145. This multiplier is from the input/output model for the State of Wyoming that is housed at the Dept. of Agricultural Economics, University ofWyoming.

TABLE A10-6

COMPARISON OF ALTERNATIVES: CUMULATIVE (1991-2010) SUMMARY OF ALL RESOURCES EXCEPT TIMBER AND RANGE MANAGEMENT[1,2]

SUBJECT	ALTERNATIVE A		ALTERNATIVE B		ALTERNATIVE C		PREFERRED ALTERNATIVE	
DIRECT OUTPUT VALUE								
Oil	276,395		332,067		274,843		275,368	
Gas	519,977		624,712		517,057		518,046	
Coalbed Methane	218,832[6]	125,533[7]	218,832[6]	125,533[7]	134,251[6]	78,629[7]	134,251[6]	78,629[7]
Coal	5,788,830		6,066,820		5,293,430		5,788,830	
Trona	6,715,250		7,779,800		7,779,800		7,779,800	
Recreation	108,525		133,806		151,616		142,711	
TOTAL	13,627,809[6]	13,534,510[7]	15,156,037[6]	15,062,738[7]	14,150,997[6]	14,095,375[7]	14,639,006[6]	14,583,384[7]
IMPACTS ON TOTAL AREA OUTPUT[3]								
Oil	416,275		500,122		413,937		414,728	
Gas	783,130		940,870		778,732		780,222	
Coalbed Methane	329,580[6]	189,063[7]	329,580[6]	189,063[7]	202,194[6]	118,422[7]	202,194[6]	118,422[7]
Coal	10,391,789		10,890,821		9,502,474		10,391,789	
Trona	12,054,850		13,965,870		13,965,870		13,965,870	
Recreation	222,968		274,909		311,500		293,205	
TOTAL	24,198,592[6]	24,058,075[7]	26,902,172[6]	26,761,655[7]	25,174,707[6]	25,090,935[7]	26,048,008[6]	25,964,236[7]
DIRECT INCOME EFFECTS								
Oil	22,688		27,258		22,561		22,604	
Gas	42,683		51,280		42,443		42,524	
Coalbed Methane	17,963[6]	10,305[7]	17,963[6]	10,305[7]	11,020[6]	6,454[7]	11,020[6]	6,454[7]

TABLE A10-6 (continued)

SUBJECT	ALTERNATIVE A		ALTERNATIVE B		ALTERNATIVE C		PREFERRED ALTERNATIVE	
Coal	1,033,451		1,083,079		945,010		1,033,451	
Trona	1,198,840		1,388,889		1,388,889		1,388,889	
Recreation	36,210		44,645		50,588		47,617	
TOTAL	2,351,835[6]	2,344,177[7]	2,613,114[6]	2,605,456[7]	2,460,511[6]	2,455,945[7]	2,546,105[6]	2,541,539[7]
IMPACTS ON TOTAL AREA INCOME [5]								
Oil	46,276		55,597		46,016		46,104	
Gas	87,058		104,593		86,569		86,734	
Coalbed Methane	36,638[6]	21,017[7]	36,638[6]	21,017[7]	22,477[6]	13,165[7]	22,477[6]	13,165[7]
Coal	1,869,028		1,958,782		1,709,079		1,869,028	
Trona	2,168,139		2,511,848		2,511,848		2,511,848	
Recreation	56,099		69,167		78,373		73,770	
TOTAL	4,263,238[6]	4,247,617[7]	4,736,625[6]	4,721,004[7]	4,454,362[6]	4,445,050[7]	4,609,961[6]	4,600,649[7]

[1] Figures in this table are expressed in $1000 and rounded to the nearest whole number.

[2] Impacts listed in this table are cumulative changes over the next 20 years. Timber and range management will be added to the totals from this table in a seperate table which addresses their various scenarios.

[3] Figures in these rows were calculated by multiplying direct output values times total output multipliers that are specific to the listed resource sector. These multipliers were acquired from an input/output model developed by the University of Wyoming, Dept. of Agricultural Economics, College of Agriculture, Extension. They are: for oil, gas, and coalbed methane (1.506086); for coal and trona (1.795145); and for recreation (2.054536). The resulting figures represent the amount of direct, indirect, and induced output resulting from the activities proposed for the given alternative.

[4] Figures in these rows show the income paid directly to households by the listed resource sector. They were calculated by multiplying direct output values by direct income multipliers that are specific to the listed resource sectors. The source of these multipliers are the same as listed in footnote 3. They are: for oil, gas, and coalbed methane (.082086); for coal and trona (.178525); and for recreation (.333658).

[5] Figures in these rows specify the amount of direct, indirect, and induced income accruing to households as the result of activities proposed under each alternative. They were calculated by multiplying direct output values times total income multipliers for the given sectors. The source of these multipliers is the same as listed in footnote 3. The multipliers are: for oil, gas, and coalbed methane (.167426); for coal and trona (.322868); and for recreation (.516920).

TABLE A10-6 (continued)

[6] This figure results from an assumption that coalbed methane wells are producing at economically viable levels and do not require a tax credit. They are producing at least 225 MCF/well/day.

[7] This figure results from an assumption that coalbed methane wells are not producing at economically viable levels without a tax credit. They are producing less than 225 MCF/well/day.

TABLE A10-7

COMPARISON OF ALTERNATIVES: CUMULATIVE (1991-2010) SUMMARY OF ALL RESOURCES INCLUDING TIMBER AND RANGE MANAGEMENT[1,2]

SCENARIO	RANGE MANAGEMENT				TIMBER MANAGEMENT				TOTAL ALL OTHER RESOURCES
	MAXIMUM AUM USE LEVEL/YR				ANNUAL OUTPUT (MBF) AND PRICE/MBF				
					500 MBF/YR		1000 MBF/YR		
	180,000	200,000	318,647	413,147	@$175/MBF	@$220/MBF	@$175/MBF	@$220/MBF	
DIRECT OUTPUT VALUE:									
ALTERNATIVE A									
Without Coalbed M. Tax Cr.[3]	211,000	235,000	374,000		1,750	2,200	3,500	4,400	13,627,809
With Coalbed M. Tax Cr.[4]	211,000	235,000	374,000		1,750	2,200	3,500	4,400	13,534,510
ALTERNATIVE B									
Without Coalbed M. Tax Cr.	211,000	235,000	374,000	485,000	1,750	2,200	3,500	4,400	15,156,037
With Coalbed M. Tax Cr.	211,000	235,000	374,000	485,000	1,750	2,200	3,500	4,400	15,062,738
ALTERNATIVE C									
Without Coalbed M. Tax Cr.	211,000	235,000	374,000		1,750	2,200			14,150,997
With Coalbed M. Tax Cr.	211,000	235,000	374,000		1,750	2,200			14,095,375
PREFERRED ALTERNATIVE									
Without Coalbed M. Tax Cr.	211,000	235,000	374,000		1,750	2,200			14,639,006
With Coalbed M. Tax Cr.	211,000	235,000	374,000		1,750	2,200			14,583,384
IMPACTS ON TOTAL AREA OUTPUT[5]:									
ALTERNATIVE A									
Without Coalbed M. Tax Cr.	596,000	662,000	1,055,000		4,216	5,300	8,430	10,598	24,198,592
With Coalbed M. Tax Cr.	596,000	662,000	1,055,000		4,216	5,300	8,430	10,598	24,058,075
ALTERNATIVE B									
Without Coalbed M. Tax Cr.	596,000	662,000	1,055,000	1,368,000	4,216	5,300	8,430	10,598	26,902,172

TABLE A10-7 (continued)

SCENARIO	RANGE MANAGEMENT				TIMBER MANAGEMENT				TOTAL ALL OTHER RESOURCES
	MAXIMUM AUM USE LEVEL/YR				ANNUAL OUTPUT (MBF) AND PRICE/MBF				
					500 MBF/YR		1000 MBF/YR		
	180,000	200,000	318,647	413,147	@$175/MBF	@$220/MBF	@$175/MBF	@$220/MBF	
With Coalbed M. Tax Cr.	596,000	662,000	1,055,000	1,368,000	4,216	5,300	8,430	10,598	26,761,655
ALTERNATIVE C									
Without Coalbed M. Tax Cr.	596,000	662,000	1,055,000		4,216	5,300			25,174,707
With Coalbed M. Tax Cr.	596,000	662,000	1,055,000		4,216	5,300			25,090,935
PREFERRED ALTERNATIVE									
Without Coalbed M. Tax Cr.	596,000	662,000	1,055,000		4,216	5,300			26,048,008
With Coalbed M. Tax Cr.	596,000	662,000	1,055,000		4,216	5,300			25,964,236
DIRECT INCOME EFFECTS[6]:									
ALTERNATIVE A									
Without Coalbed M. Tax Cr.	31,000	35,000	55,000		394	494	788	990	2,351,835
With Coalbed M. Tax Cr.	31,000	35,000	55,000		394	494	788	990	2,344,177
ALTERNATIVE B									
Without Coalbed M. Tax Cr.	31,000	35,000	55,000	72,000	394	494	788	990	2,613,114
With Coalbed M. Tax Cr.	31,000	35,000	55,000	72,000	394	494	788	990	2,605,456
ALTERNATIVE C									
Without Coalbed M. Tax Cr.	31,000	35,000	55,000		394	494			2,460,511
With Coalbed M. Tax Cr.	31,000	35,000	55,000		394	494			2,455,945
PREFERRED ALTERNATIVE									
Without Coalbed M. Tax Cr.	31,000	35,000	55,000		394	494			2,546,105
With Coalbed M. Tax Cr.	31,000	35,000	55,000		394	494			2,541,539

TABLE A10-7 (continued)

SCENARIO	RANGE MANAGEMENT				TIMBER MANAGEMENT				TOTAL ALL OTHER RESOURCES
	MAXIMUM AUM USE LEVEL/YR				ANNUAL OUTPUT (MBF) AND PRICE/MBF				
					500 MBF/YR		1000 MBF/YR		
	180,000	200,000	318,647	413,147	@$175/MBF	@$220/MBF	@$175/MBF	@$220/MBF	
IMPACTS ON TOTAL AREA INCOME[7]:									
ALTERNATIVE A									
Without Coalbed M. Tax Cr.	104,000	115,000	183,000		920	1,158	1,840	2,314	4,263,238
With Coalbed M. Tax Cr.	104,000	115,000	183,000		920	1,158	1,840	2,314	4,247,617
ALTERNATIVE B									
Without Coalbed M. Tax Cr.	104,000	115,000	183,000	238,000	920	1,158	1,840	2,314	4,736,625
With Coalbed M. Tax Cr.	104,000	115,000	183,000	238,000	920	1,158	1,840	2,314	4,721,004
ALTERNATIVE C									
Without Coalbed M. Tax Cr.	104,000	115,000	183,000		920	1,158			4,454,362
With Coalbed M. Tax Cr.	104,000	115,000	183,000		920	1,158			4,445,050
PREFERRED ALTERNATIVE									
Without Coalbed M. Tax Cr.	104,000	115,000	183,000		920	1,158			4,609,961
With Coalbed M. Tax Cr.	104,000	115,000	183,000		920	1,158			4,600,649

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[1] Figures in this table are expressed in $1000 and rounded to the nearest whole number. Blank space in row/column intersection means scenario doesn't apply.

[2] Impacts listed in this table are cumulative changes over the next 20 years.

[3] The "without tax credit" scenarios assume that coalbed methane wells are producing at economically viable levels and do not require a tax credit. They are producing at least 225 MCF/well/day.

[4] The "with tax credit" scenarios assume that coalbed methane wells are not producing at economically viable levels without a tax credit. They are producing less than 225 MCF/well/day.

[5] Figures in these rows were calculated by multiplying direct output values times total output multipliers that are specific to the listed resource sector. These multipliers were acquired from an input/output model developed by the University of Wyoming, Dept. of Agricultural Economics, College of Agriculture, Extension. The resulting figures represent the amount of direct, indirect, and induced output resulting from the activities proposed for the given alternative.

TABLE A10-7 (continued)

[6] Figures in these rows show the income paid directly to households by the listed resource sector. They were calculated by multiplying direct output values by direct income multipliers that are specific to the listed resource sectors. The source of these multipliers are the same as listed in footnote 5.

[7] Figures in these rows specify the amount of direct, indirect, and induced income accruing to households as the result of activities proposed under each alternative. They were calculated by multiplying direct output values times total income multipliers for the given sectors. The source of these multipliers is the same as listed in footnote 5.

TABLE A10-8

SUMMARY COMPARISON OF ALTERNATIVES: CUMULATIVE (1991-2010) ECONOMIC IMPACTS FROM ALL RESOURCES-COMPARING LOWEST TO HIGHEST POTENTIAL VALUES[1,2]

SCENARIO	CUMULATIVE VALUE OF ALL RESOURCES	POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 180,000/YR[9]		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 200,000/YR[10]		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 318,647/YR[11]		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 413,147/YR[12]	
		Lowest[13]	Highest[13]	Lowest[13]	Highest[13]	Lowest[13]	Highest[13]	Lowest[13]	Highest[13]
DIRECT OUTPUT VALUE									
ALTERNATIVE A									
Without Coalbed M. Tax Cr.[3]	13,627,809	13,840,559	13,843,209	13,864,559	13,867,209	14,003,559	14,006,209	NONE	NONE
With Coalbed M. Tax Cr.[4]	13,534,510	13,747,260	13,749,910	13,771,260	13,773,910	13,910,260	13,912,910	NONE	NONE
ALTERNATIVE B									
Without Coalbed M. Tax Cr.	15,156,037	15,368,787	15,371,437	15,392,787	15,395,437	15,531,787	15,534,437	15,642,787	15,645,437
With Coalbed M. Tax Cr.	15,062,738	15,275,488	15,278,138	15,299,488	15,302,138	15,438,488	15,441,138	15,549,488	15,552,138
ALTERNATIVE C									
Without Coalbed M. Tax Cr.	14,150,997	14,363,747	14,364,197	14,387,747	14,388,197	14,527,747	14,527,197	NONE	NONE
With Coalbed M. Tax Cr.	14,095,375	14,308,125	14,308,575	14,332,125	14,332,575	14,471,125	14,471,575	NONE	NONE
PREFERRED ALTERNATIVE									
Without Coalbed M. Tax Cr.	14,639,006	14,851,756	14,852,206	14,875,756	14,876,206	15,014,756	15,015,206	NONE	NONE
With Coalbed M. Tax Cr.	14,583,384	14,796,134	14,796,584	14,820,134	14,820,584	14,959,134	14,959,584	NONE	NONE

TABLE A10-8 (continued)

SCENARIO	CUMULATIVE VALUE OF ALL RESOURCES	POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 180,000/YR[9]		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 200,000/YR[10]		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 318,647/YR[11]		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 413,147/YR[12]	
		Lowest[13]	Highest[13]	Lowest[13]	Highest[13]	Lowest[13]	Highest[13]	Lowest[13]	Highest[13]
IMPACTS ON TOTAL AREA OUTPUT[5]									
ALTERNATIVE A									
Without Coalbed M. Tax Cr.	24,198,592	24,798,808	24,805,190	24,864,808	24,871,190	25,257,808	25,264,190	NONE	NONE
With Coalbed M. Tax Cr.	24,058,075	24,658,291	24,664,673	24,724,291	24,730,673	25,117,291	25,123,673	NONE	NONE
ALTERNATIVE B									
Without Coalbed M. Tax Cr.	26,902,172	27,502,388	27,508,770	27,568,388	27,574,770	27,961,388	27,967,770	28,274,388	28,280,770
With Coalbed M. Tax Cr.	26,761,655	27,361,871	27,368,253	27,427,871	27,434,253	27,820,871	27,827,253	28,133,871	28,140,253
ALTERNATIVE C									
Without Coalbed M. Tax Cr.	25,174,707	25,774,923	25,776,007	25,840,923	25,842,007	26,233,923	26,235,007	NONE	NONE
With Coalbed M. Tax Cr.	25,090,935	25,691,151	25,692,235	25,757,151	25,758,235	26,150,151	26,151,235	NONE	NONE
PREFERRED ALTERNATIVE									
Without Coalbed M. Tax Cr.	26,048,008	26,648,224	26,649,308	26,714,224	26,715,308	27,107,224	27,108,308	NONE	NONE
With Coalbed M. Tax Cr.	25,964,236	26,564,452	26,565,536	26,630,452	26,631,536	27,023,452	27,024,536	NONE	NONE
DIRECT INCOME EFFECTS[6]									
ALTERNATIVE A									
Without Coalbed M. Tax Cr.	2,351,835	2,383,229	2,383,825	2,387,229	2,387,825	2,407,229	2,407,825	NONE	NONE
With Coalbed M. Tax Cr.	2,344,177	2,375,571	2,376,167	2,379,571	2,380,167	2,399,571	2,400,167	NONE	NONE

TABLE A10-8 (continued)

SCENARIO	CUMULATIVE VALUE OF ALL RESOURCES	POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 180,000/YR[9]		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 200,000/YR[10]		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 318,647/YR[11]		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 413,147/YR[12]	
		Lowest[13]	Highest[13]	Lowest[13]	Highest[13]	Lowest[13]	Highest[13]	Lowest[13]	Highest[13]
ALTERNATIVE B									
Without Coalbed M. Tax Cr.	2,613,114	2,644,508	2,645,104	2,648,508	2,649,104	2,668,508	2,669,104	2,685,508	2,686,104
With Coalbed M. Tax Cr.	2,605,456	2,636,850	2,637,446	2,640,850	2,641,446	2,660,850	2,661,446	2,677,850	2,678,446
ALTERNATIVE C									
Without Coalbed M. Tax Cr.	2,460,511	2,491,905	2,492,005	2,495,905	2,496,005	2,515,905	2,516,005	NONE	NONE
With Coalbed M. Tax Cr.	2,455,945	2,487,339	2,487,439	2,491,339	2,491,439	2,511,339	2,511,439	NONE	NONE
PREFERRED ALTERNATIVE									
Without Coalbed M. Tax Cr.	2,546,105	2,577,499	2,577,599	2,581,499	2,581,599	2,601,499	2,601,599	NONE	NONE
With Coalbed M. Tax Cr.	2,541,539	2,572,933	2,573,033	2,576,933	2,577,033	2,596,933	2,597,033	NONE	NONE
IMPACTS ON TOTAL AREA INCOME[7]									
ALTERNATIVE A									
Without Coalbed M. Tax Cr.	4,263,238	4,368,158	4,369,552	4,379,158	4,380,552	4,447,158	4,448,552	NONE	NONE
With Coalbed M. Tax Cr.	4,247,617	4,352,537	4,353,931	4,363,537	4,364,931	4,431,537	4,432,931	NONE	NONE
ALTERNATIVE B									
Without Coalbed M. Tax Cr.	4,736,625	4,841,545	4,842,939	4,852,545	4,853,939	4,920,545	4,921,939	4,975,545	4,976,939
With Coalbed M. Tax Cr.	4,721,004	4,825,924	4,827,318	4,836,924	4,838,318	4,904,924	4,906,318	4,959,924	4,961,318

TABLE A10-8 (continued)

SCENARIO	CUMULATIVE VALUE OF ALL RESOURCES	POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 180,000/YR^{9}		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 200,000/YR^{10}		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 318,647/YR^{11}		POTENTIAL VALUE SPREAD IF: MAXIMUM AUM USE 413,147/YR^{12}	
		Lowest^{13}	Highest^{13}	Lowest^{13}	Highest^{13}	Lowest^{13}	Highest^{13}	Lowest^{13}	Highest^{13}
ALTERNATIVE C									
Without Coalbed M. Tax Cr.	4,454,362	4,559,282	4,559,520	4,570,282	4,570,520	4,638,282	4,638,520	NONE	NONE
With Coalbed M. Tax Cr.	4,445,050	4,549,970	4,550,208	4,560,970	4,561,208	4,628,970	4,629,208	NONE	NONE
PREFERRED ALTERNATIVE									
Without Coalbed M. Tax Cr.	4,609,961	4,714,881	4,715,119	4,725,881	4,726,119	4,793,881	4,794,119	NONE	NONE
With Coalbed M. Tax Cr.	4,600,649	4,705,569	4,705,807	4,716,569	4,716,807	4,784,569	4,784,807	NONE	NONE

[1] Figures in this table are expressed in $1000 and rounded to the nearest whole number. NONE in row/column intersection means scenario does not apply.

[2] Impacts listed in this table are cumulative changes over the next 20 years.

[3] The "without tax credit" scenarios assume that coalbed methane wells are producing at economically viable levels and do not require a tax credit. They are producing at least 225 MCF/well/day.

[4] The "with tax credit" scenarios assume that coalbed methane wells are not producing at economically viable levels without a tax credit. They are producing less than 225 MCF/well/day.

[5] Figures in this row were calculated by multiplying direct output values times total output multipliers that are specific to the listed resource sector. These multipliers were acquired from an input/output model developed by the University of Wyoming, Dept. of Agricultural Economics, College of Agriculture, Extension. The resulting figures represent the amount of direct, indirect, and induced output resulting from the activities proposed for the given alternative.

[6] Figures in these rows show the income paid directly to households by the listed resource sector. They were calculated by multiplying direct output values by direct income multipliers that are specific to the listed resource sectors. The source of these multipliers are the same as listed in footnote 5.

[7] Figures in these rows specify the amount of direct, indirect, and induced income accruing to households as the result of activities proposed under each alternative. They were calculated by multiplying direct output values times total income multipliers for the given sectors. The source of these multipliers is the same as listed in footnote 5.

TABLE A10-8 (continued)

[8] Figures in this column are the sum total of values for oil, gas, coalbed methane, coal, trona, and recreation from 1991 through 2010. They comprise a major portion of the totals shown for the columns to the right in each respective row.

[9] Figures in these columns assume a maximum livestock AUM use of 180,000/year. Dollar values from the range management sector at this use level are added to dollar values from all other resources with each individual column incorporating a different timber output scenario. Other than the difference in timber values incorporated, input is the same for both columns. The 180,000 AUM level is about what is currently being used by livestock in the Resource Area.

[10] Figures in these columns assume a maximum livestock AUM use of 200,000/year. Dollar values from the range management sector at this use level are added to dollar values from all other resources with each individual column incorporating a different timber output scenario. Other than the difference in timber values incorporated, input is the same for both columns.

[11] Figures in these columns assume a maximum livestock AUM use of 318,647/year. This is the current preferred use level in the Resource Area. Dollar values from the range management sector at this use level are added to the dollar values from all other resources with each individual column incorporating a different timber output scenario. Other than the difference in the timber values incorporated, input is the same for both columns.

[12] Figures in these columns assume a maximum livestock AUM use of 413,147/year. This is a hypothetical preferred use level in the Resource Area under maximum range conditions. Dollar values from the range management sector at this use level are added to the dollar values from all other resources with each individual column incorporating a different timber output scenario. Other than the difference in the timber values incorporated, input is the same for both columns.

[13] The alternatives analyzed in this RMP EIS assume a lower bound on potential annual timber harvests of 500 MBF. Alternatives A and B assume that the upper bound on timber harvesting is 1000 MBF/year while Alternatives C and Preferred assume an upper bound of 500 MBF/year. For this analysis and this table, timber harvest values applied to the lowest end of the ranges shown on this table are calculated using $175/MBF and the timber value applied to the highest limit of each range is $220/MBF. As indicated by the column headers, the livestock AUM usage in this report also varies from a low of 180,000/year for all alternatives to a potential high of 318,647/year for Alternatives A, C, and Preferred and a hypothetical high of 413,147/year for Alternative B. Figures in this column include the values of other resources summarized in column 1 of this table.

TABLE A10-9

OIL AND GAS SOCIOECONOMIC IMPACTS: ALTERNATIVE A[1]

	OIL					GAS					OIL AND GAS IMPACTS	
YEAR	OUTPUT (BBLs)	DIRECT OUTPUT VALUE ($)	IMPACTS ON TOTAL AREA OUTPUT ($)[4]	DIRECT INCOME EFFECTS ($)[5]	IMPACTS ON TOTAL AREA INCOME ($)[6]	OUTPUT (MCF)	DIRECT OUTPUT VALUE ($)[7]	IMPACTS ON TOTAL AREA OUTPUT ($)[8]	DIRECT INCOME EFFECTS ($)[9]	IMPACTS ON TOTAL AREA INCOME ($)[10]	DIRECT EMPLOY-MENT (numbers) [11,12,13]	IMPACTS ON TOTAL AREA EMPLOY-MENT (numbers) [14]
1990 (BASE YEAR)	694,112	15,992,340[2]	24,085,840	1,312,747	2,677,534	26,116,400	26,116,400	39,333,544	2,143,791	4,372,564	484	1,676
1991	704,858	14,097,160[3]	21,231,535	1,157,179	2,360,231	26,520,725	26,520,725	39,942,493	2,176,980	4,440,259	489	1,694
1992	713,614	14,272,280	21,495,281	1,171,55	2,389,551	26,850,175	26,850,175	40,438,673	2,204,023	4,495,417	494	1,711
1993	714,808	14,296,160	21,531,246	1,173,51	2,393,549	26,895,100	26,895,100	40,506,334	2,207,711	4,502,939	494	1,711
1994	723,564	14,471,280	21,794,992	1,187,889	2,422,869	27,224,550	27,224,550	41,002,514	2,234,754	4,558,098	499	1,728
1995	720,778	14,415,560	21,711,073	1,183,316	2,413,540	27,119,725	27,119,725	40,844,638	2,226,150	4,540,547	497	1,721
1996	725,952	14,519,040	21,866,923	1,191,810	2,430,865	27,314,400	27,314,400	41,137,835	2,242,130	4,573,141	500	1,732
1997	720,380	14,407,600	21,699,085	1,182,662	2,412,207	27,104,750	27,104,750	40,822,085	2,224,921	4,538,040	497	1,721
1998	711,624	14,232,480	21,435,339	1,168,287	2,382,887	26,775,300	26,775,300	40,325,904	2,197,877	4,482,881	493	1,707
1999	704,460	14,089,200	21,219,547	1,156,526	2,358,898	26,505,750	26,505,750	39,919,939	2,175,751	4,437,752	489	1,694
2000	688,939	13,778,780	20,752,028	1,131,045	2,306,926	25,921,725	25,921,725	39,040,347	2,127,811	4,339,971	481	1,666
2001	686,550	13,731,000	20,680,067	1,127,123	2,298,926	25,831,875	25,831,875	38,905,025	2,120,435	4,324,928	480	1,662
2002	677,794	13,555,880	20,416,321	1,112,748	2,269,607	25,502,425	25,502,425	38,408,845	2,093,392	4,269,769	476	1,649
2003	662,670	13,253,400	19,960,760	1,087,919	2,218,964	24,933,375	24,933,375	37,551,807	2,046,681	4,174,495	443	1,534
2004	663,466	13,269,320	19,984,737	1,089,225	2,221,629	24,963,325	24,963,325	37,596,914	2,049,139	4,179,510	443	1,534
2005	662,670	13,253,400	19,960,760	1,087,919	2,218,964	24,933,375	24,933,375	37,551,807	2,046,681	4,174,495	443	1,534

TABLE A10-9 (continued)

YEAR	OIL					GAS					OIL AND GAS IMPACTS	
	OUTPUT (BBLs)	DIRECT OUTPUT VALUE ($)	IMPACTS ON TOTAL AREA OUTPUT ($)[4]	DIRECT INCOME EFFECTS ($)[5]	IMPACTS ON TOTAL AREA INCOME ($)[6]	OUTPUT (MCF)	DIRECT OUTPUT VALUE ($)[7]	IMPACTS ON TOTAL AREA OUTPUT ($)[8]	DIRECT INCOME EFFECTS ($)[9]	IMPACTS ON TOTAL AREA INCOME ($)[10]	DIRECT EMPLOY-MENT (numbers) 11,12,13	IMPACTS ON TOTAL AREA EMPLOY-MENT (numbers) 14
2006	678,590	13,571,800	20,440,298	1,114,055	2,272,272	25,532,375	25,532,375	38,453,953	2,095,851	4,274,783	451	1,562
2007	677,396	13,547,920	20,404,333	1,112,095	2,268,274	25,487,450	25,487,450	38,386,292	2,092,163	4,267,262	450	1,559
2008	675,008	13,500,160	20,332,402	1,108,174	2,260,278	25,397,600	25,397,600	38,250,970	2,084,787	4,252,219	449	1,555
2009	674,610	13,492,200	20,320,414	1,107,521	2,258,945	25,382,625	25,382,625	38,228,416	2,083,558	4,249,711	449	1,555
2010	632,024	12,640,480	19,037,650	1,037,606	2,116,345	23,780,300	23,780,300	35,815,177	1,952,030	3,981,441	428	1,482
TOTAL (1991-2010)	13,819,755	276,395,100	416,274,791	22,688,168	46,275,726	519,976,925	519,976,925	783,129,967	42,682,826	87,057,657		

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[1] Does not include coalbed methane.

[2] Calculated by multiplying 1990 output level times a BBL price of $23.04 which is the average price reported for sweet crude in the Green River Resource Area in 1990. The average price per barrel in this Area is usually about $2 higher than the average reported annually for the State of Wyoming.

[3] From 1991 through 2010 the average estimated price for sweet crude in this table is $20.00. Therefore, values/year are calculated by multiplying $20 times the annual oil output volume listed in the previous column.

[4] The figures in this column represent the impacts on the area's total economic output from the level of oil output proposed in Alternative A. Figures are calculated by multiplying the annual direct oil output values times a total oil/gas output multiplier of 1.506086. This multiplier is an average for the oil/gas sector for the State of Wyoming and was acquired from an input/output model developed by the University of Wyoming, Dept. of Agricultural Economics, College of Agriculture, Extension.

[5] Direct income is the income realized by households directly from the oil sector. It is calculated by multiplying direct oil output value/year times an oil/gas sector direct income multiplier of .082086. The source of the multiplier is the same as in footnote 4.

[6] The effects on total area income from the level of oil activities proposed under this alternative are calculated by multiplying the direct annual output values times an average state total oil/gas income multiplier of .167426. The source of the multiplier is the same as in footnote 4.

TABLE A10-9 (continued)

[7] Calculated by multiplying output level times an MCF price of $1.00 which is the average price assumed for gas in this analysis.

[8] The figures in this column represent the impacts on the area's total economic output from the level of gas output proposed in Alternative A. Figures are calculated by multiplying the annual direct gas output values times a total oil/gas output multiplier of 1.506086. This multiplier is an average for the oil/gas sector for the State of Wyoming. The source is the same as in footnote 4.

[9] Direct income is the income realized by households directly from the gas sector. It is calculated by multiplying direct gas output value/year times an oil/gas sector direct income multiplier of .082086. The source of the multiplier is the same as in footnote 4.

[10] The effects on total area income from the level of gas activities proposed under this alternative are calculated by multiplying the direct annual output values times an average state total oil/gas income multiplier of .167426. The source of the multiplier is the same as in footnote 4.

[11] The same workers would be drilling, completing, and maintaining both oil and/or gas wells in the Resource Area.

[12] Figures in this column are estimates based upon oil/gas drilling, completion, and production employment information acquired for the Big Piney/LaBarge CAP. It relates the number of projected wells completed and operating each year to the number of workers required.

[13] This RMP assumes that exceptions and mitigation measures are possible throughout crucial area restriction periods as long as the well being of wildlife is not adversely impacted. It also assumes that in most cases drilling and completion of new wells would only be hampered by the severe weather of January and February. Therefore, annual drilling time each year would be about 305 days. It is also assumed that one drilling rig can drill about 15 wells and one completion rig complete about 10 wells per 305 day season. This estimates that it takes 20 days to drill and 30 days to complete a well in the Resource Area. It further assumes that, on average, there are 20 workers on a drilling rig and 5 on a completion rig. One maintenance worker is estimated to be able to oversee 5 producing wells. For example, in the base year 70 wells were reported drilled and about 1,744 wells were already producing. This is estimated to result in about 5 drilling rigs with 20 workers each, 7 completion rigs with 5 workers each, and 350 total maintenance workers for all producing wells.

[14] Impacts of oil/gas activity under Alternative A on total area employment levels is estimated by multiplying the direct annual employment figures in the previous column times a multiplier of 3.4633764. Source of multiplier is the same as in footnote 4.

APPENDIX 11-1

PRODUCTION PARAMETERS FOR VEGETATION COMMUNITIES

(pounds/acre)

Landsat Vegetation Type	Community	Precipitation Zone		
		7-9"	10-14"	15-19"
High Density Sagebrush	Sagebrush GT 35%	——	700-1,500	900-2,400
	Open Aspen	——	——	1,400-2,400
	Meadow	——	1,200-6,000	1,200-7,500
	Mountain Shrub	——	900-1,400	500-2,400
Low Density Sagebrush	Sagebrush LT 35%	200-700	500-1,200	
	Desert Shrub	300-700	500-1,200	——
	Grass	——	600-1,400	——
Saltbush	Saltbush	150-600	150-750	——
Greasewood	Greasewood	300-900	1,200-2,500	——
Riparian	Meadow	1,400-5,000	1,200-6,000	1,500-7,500
	Broadleaf	1,400-2,700	700-6,000	1,400-7,500
	Greasewood	——	1,200-2,500	——
	Sagebrush	200-700	700-1,500	900-2,400
Aspen	Broadleaf	1,400-2,700	700-6,000	1,400-7,500
	Sagebrush	——	800-1,500	1,200-2,400
Conifer	Conifer	——	700-1,500	1,400-2,400
Barren	Barren	——	——	——
Juniper	Juniper	200-1,100	200-1,400	450-750
Sand Dune	Sand Dune	200-700	700-1,500	

APPENDIX 11-2

AVERAGE STOCKING RATES
(Acres/AUM by Precipitation Zone)

Landsat Classification	7-9 Inch	10-14 Inch	15-19 Inch
High Density Sagebrush	7.0	4.0	3.5
Low Density Sagebrush	15.0	8.5	5.0
Saltbush	8.0	6.5	—
Greasewood	6.5	4.5	—
Aspen	6.0	4.0	2.5
Riparian	1.5	1.0	0.7
Conifer	2.0	12.0	12.0
Juniper	18.0	14.0	12.0
Barren	—	—	—
Sand Dune	—	—	—
Agriculture	—	—	—
Water	—	—	—

APPENDIX 11-3

SUMMARY OF FIRE EFFECTS ON MAJOR GRASS AND GRASSLIKE SPECIES

Species	Response to Fire	Recovery Time (Years)	Remarks
Bluegrass			The bluegrasses are generally small plants and fire damage is minimal with late summer and fall burns.
Big	Slight damage	1-3	
Cusick	Slight damage	1-3	
Nevada	Slight damage	1-3	
Sandberg	Undamaged	1-3	
Cheatgrass	Undamaged	1	Any reduction in cheatgrass stands is usually short-lived.
Idaho Fescue	Slight to severe damage	2-30	Spring or fall burning with adequate soil moisture appears to damage plants only slightly, but this species can be seriously harmed by hot summer or fall fires, particularly where precipitation is marginal for the existence of this species .
Indian ricegrass	Slight damage	2-4	Good resistance to burning but slow to increase in density .
Junegrass	Undamaged	1-3	Probably increase in density for several years after burning.
Needlegrass			Needlegrasses are generally the least fire-resistant bunchgrasses. Large plants are damaged more than small plants. A 50 percent reduction in basal area should be anticipated among the various size plants in a given area.
Columbia	Moderate damage	3-5	
Needle-and-thread	Severe damage	4-8	
Thurber	Severe damage	4-8	
Western	Moderate damage	3-5	
Plains reedgrass	Undamaged	1-2	Rhizomatous species that is fire resistant.
Sedges			
Douglas	Undamaged	1-3	
Threadleaf	Severe damage	4-10	
Bottlebrush squirreltail	Slight damage	1-3	One of the most fire-resistant bunchgrasses, although burning in a dry year can reduce basal area. Bottlebrush squirreltail can increase several years after burning .
Wheatgrass			
Bluebunch	Slight damage	1-3	Bluebunch wheatgrass can be damaged if burned in a dry year. Other wheatgrasses are difficult to burn in seeded monocultures.
Crested	Undamaged	1-2	
Intermediate	Undamaged	1-2	
Pubescent	Undamaged	1-2	
Riparian	Undamaged	1-2	
Tall	Undamaged	1-2	
Thickspike	Undamaged	1-2	
Western	Undamaged	1-2	

SOURCE: Wright, Henry A., Neuenschwander, Leon F., and Britton, Carlton M. "The Role and Use of Fire in Sagebrush-Grass and Pinyon-Juniper Plant Communities, a State-of-the-Art Review," USDA Forest Service General Technical Report INT-58. Intermountain Forest and Range Experiment Station, Ogden, Utah, September 1979.

APPENDIX 11-4

RESPONSE OF COLD DESERT FORBS TO FALL BURNING

Severely Damaged	Slightly Damaged	Undamaged
Hairy fleabane	Astragalus	Arrowleaf balsamroot
Hoary phlox	Matroot	Common comandra
Littleleaf pussytoes	Munro globemallow	Common sunflower
Low pussytoes	Northwestern paintbrush	Coyote tobacco
Mat eriogonum	Pinnate tansymustard	Douglas knotweed
Uinta sandwort	Plumeweed	Flaxleaf plainsmustard
Wyeth eriogonum	Red globemallow	Flixweed tansymustard
	Sticky geranium	Foothill deathcamas
	Tailcup lupine	Gayophytum
	Tapertip hawksbeard	Goldenrod
	Tongueleaf violet	Goosefoot
	Tumblemustard	Lambstongue groundsel
	Wavyleaf thistle	Longleaf phlox
	Whitlow-wart	Orange arnica
	Wild lettuce	Pale alyssum
		Purpledaisy fleabane
		Russian thistle
		Velvet lupine
		Western yarrow
		Wild onion

SOURCE: Wright, Henry A., Neuenschwander, Leon F., and Britton, Carlton M. "The Role and Use of Fire in Sagebrush-Grass and Pinyon-Juniper Plant Communities, a State-of-the-Art Review," USDA Forest Service General Technical Report INT-58. Intermountain Forest and Range Experiment Station, Ogden, Utah, September 1979.

APPENDIX 11-5

SUMMARY OF FIRE EFFECT ON MAJOR SHRUB SPECIES IN THE DRIER FOREST AND SAGEBRUSH GRASS ZONES OF THE INTERMOUNTAIN REGION

Species	Sprouting Ability	Response to Fire	Remarks Recovery Time	(Years)
Antelope bitterbrush	Weak sprouter	Severely damaged by summer & fall burns	30-40	Effect determined by growth form; decumbent form sprouts vigorously, columnar form is a weak sprouter. If plants sprout, they will recover in 9 to 10 years. Spring burns enhance sprouting but fall burns are best for reproduction from seed. Burn when soil is wet.
Desert bitterbrush	Sprouter	Unharmed		
Cliffrose	Weak to nonsprouter	Usually killed by fire		
Big sagebrush	Nonsprouter	Severely harmed	30	Good seed crop before burning hastens recovery. Effective control requires burning before seed-set and periodic burns. May use black and low sage as fuel breaks. Subspecies of big-sagebrush appear to be important relative to response to burning.
Black sagebrush	Nonsprouter	Rarely burned		
Low sagebrush	Nonsprouter	Rarely burned		
Silver sagebrush	Sprouter	Slightly harmed		
Three-tip sagebrush	Weak sprouter	Harmed	30	
Rubber rabbitbrush	Vigorous sprouter	Enhanced	20-25	May be killed if burned after heavy grazing or burned in early summer.
Green rabbitbrush	Vigorous sprouter	Enhanced	20-25	
Broom snakeweed	Weak sprouter	Severely harmed	20-25	Rapid recovery.
Horsebrush	Vigorous sprouter	Enhanced	30-35	Toxic, increases fivefold within 12 years.
Gambel oak	Vigorous sprouter	Enhanced	30-40	
Common snowberry	Vigorous sprouter	Unharmed	10	Enhanced by cool fires but harmed by hot fires.
Mountain snowberry	Sprouter	Slightly harmed	15	
Mountain-mahogany	Sprouter	Slightly harmed	Recovery times not available in literature.	More information is needed.
Western mahogany	Sprouter	Slightly harmed		
Curlleaf mahogany	Sprouter	Moderately harmed		
Serviceberry	Sprouter	Slightly harmed	30-50	Highly adapted to fire; soil being moist at the time of the burn is important. Usually poor reproduction from seed.
Ocean-spray	Sprouter	Enhanced	20-30	
Ninebark	Sprouter	Enhanced	20-30	
Bittercherry	Sprouter	Unharmed	30-40	
Rose	Sprouter	Enhanced	15-30	
Spireaea	Sprouter	Unharmed	20-30	
Ceanothus				
Nonsprouting group	Nonsprouters	Harmed by spring	Recovery times not available in literature.	Seedlings are enhanced with fall burns.
Sprouting group	Vigorous sprouters	Unharmed to enhanced		

SOURCE: Wright, Henry A., Neuenschwander, Leon F., and Britton, Carlton M. "The Role and Use of Fire in Sagebrush-Grass and Pinyon-Juniper Plant Communities, a State-of-the-Art Review," USDA Forest Service General Technical Report INT-58. Intermountain Forest and Range Experiment Station, Ogden, Utah, September 1979.

APPENDIX 11-6

POISONOUS PLANT LIST

Name	Habitat	Dangerous Season	Livestock At Risk	Poisoning Condition and General Information
Tansy mustard	Sandy alkaline soils	Summer	Cattle	Large amounts over long periods of time.
Arrowgrass	Wet and alkaline bottomlands	All	All (including horses)	Hydrocyanic acid. Dangerous when frozen or in drought.
Chokecherry	Moist deep soils mostly in foothills	All	All, especially sheep	Large quantities. Dangerous when frozen or wilted. Hydrocyanic acid.
Cocklebur	Irrigated fields and wet places	Spring	All, especially cattle and pigs	0.75% of body weight, not cumulative. First leaves/cotyledons, old plants safe.
Deathcamus	Foothills	Early spring	All, especially sheep	Dry by early summer, white flower, odorless bulb, 0.5% of weight.
Greasewood	Alkaline bottomlands and washes	Spring	All, but mostly sheep	Oxalic acid. Large quantity on spring trails eaten alone.
Halogeton	Disturbed sites/roads	Fall, winter	All, but mostly sheep	Oxalic acid. Very unpalatable annual. Misused ranges.
Horsebrush	Mostly dry, semi-deserts	Spring	All, but mostly sheep	Spring trail, bighead, photosensitivity. Early yellow flower.
Larkspur	Foothills/deserts	Early spring	Cattle	Most toxic during early growth. All parts poisonous
Locoweed and Milkvetch	Desert/Mountains	All, especially spring	All	Cumulative, habit-forming, some acute poisons, crazed actions.
Lupine	Mountain foothills/ Areas of deep soil	Most when in fruit		Sheep Pods and seeds of most species dangerous, palmately compound.

Stoddard and Saith, Range Management (Second Edition), 1955.

James, L. F., Kaller, R. F., et al. “Plants Poisonous to Livestock in the Western United States,” Agriculture Information Bulletin No. 415 USDA, 1980.

APPENDIX 11-7

NOXIOUS WEEDS

Latin Name	Common Name
Cirsium arvense	Canada thistle
Convolvulus arvensis	Field bindweed
Cardaria draba	Hoary cress
Euphorbia esula	Leafy spurge
Chrysanthemum leucanthemum	Ox-eyed daisy
Sonchus arvensis	Sowthistle
Agropyron repens	Quackgrass
Centaurea repens	Russian knapweed
Linaria vulgaris hill	Yellow toadflax
Linaria dalmatica	Dalmatian toadflax
Onopordum acanthium	Scotch thistle
Carduus nutans	Musk thistle
Arctium minus	Common burdock
Carduus acanthoides	Plumeless thistle
Lepidium latifolium	Giant whitetop

APPENDIX 12

IMPACTS AND RELATIONSHIPS COMMON TO ALL ALTERNATIVES

This appendix identifies general cause and effect actions that occur in the planning area that lead to impacts. The specific impacts are discussed in Chapter 4, Environmental Consequences.

AIR QUALITY

Surface disturbing activities result in wind erosion, which contributes to the particulate concentration in the air, at least in the immediate vicinity of the activity until revegetation has produced an adequate plant cover to hold soil and reduce wind speeds near the ground.

Prescribed burning produces a short-term, but sometimes large increase in particulates in the air in the vicinity and downwind of the burn. Using good burning practices and including smoke management as part of the burn plan using the Simple Approach Smoke Estimation Model can mitigate these impacts.

While individual oil and gas wells are small, the large number of wells already in the area, plus the numbers projected for the future indicate that the cumulative impact of nitrogen oxides, hydrocarbons, sulfur oxides, particulates, and the secondary products of these pollutants emitted by equipment used in oil and gas field development and operations will contribute to reduction of visibility within the planning area.

Given the low buffering capacity of the high alpine watersheds in these areas, the current deposition of sulfate and nitrate measured in the area, should major sources of air pollutants be constructed in the GRRA, and the wind and precipitation patterns for the area, there is some likelihood that these emissions could contribute to acidification of the nearby high elevation watersheds of the Bridger, Popo Agie, and Fitzpatrick Wilderness Areas.

CULTURAL AND PALEONTOLOGICAL

Impacts to cultural resources occur through various circumstances. Land modification and erosion are common ways by which impacts to cultural resources can occur. Other agents resulting in damage to cultural resources include vandalism and illegal artifact collecting. Impacts to cultural resources are recognized to occur when one or more of the following happens:

Destruction or alteration of all or part of a property.

Isolation from or alteration of the property's surrounding environment.

Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting.

Neglect of a property resulting in its deterioration or destruction.

Transfer of a property without adequate conditions or restrictions regarding preservation, maintenance, or use (36 CFR 800.3(b)).

To identify potential impacts to cultural resources, most but not all surface-disturbing activities permitted by the BLM are preceded by a Class III (100 percent) pedestrian inventory. Some common surface disturbing activities are: minerals development, range and wildlife construction projects, vegetation burning or mechanical treatment, timber sales, and ORV use. The purpose of this inventory is to locate and evaluate all cultural resources in the impact area of a given project, and to assess the nature and magnitude of the proposed disturbance to that cultural property. Exception to the Class III inventory requirement may include projects located in previously disturbed areas or in areas that have already been covered by a Class III inventory; projects whose surface disturbance is minimal (e.g., some fence lines, coreholes, single pole powerlines); and projects planned in areas of demonstrable low potential for containing or preserving cultural resources. Once cultural resources are identified in a proposed project area, several strategies are available for reducing or eliminating the conflict. These steps are outlined in Assumptions and Assessment Guidelines.

Impacts and Relationships Common To All Alternatives

Impacts listed below will generally be insignificant once steps outlined in Assumptions and Assessment Guidelines are followed. Disturbance with no mitigation would occur for some non-NRHP sites and very rarely on NRHP sites.

Restrictions placed on surface disturbance activity to benefit other resource values will also minimize potential impacts to cultural resources.

Surface operations and support facility construction could destroy sites.

Additional human presence in areas of petroglyphs and other sensitive sites can lead to increased vandalism, artifact collecting, etc.

Management of air quality generally would be beneficial or would have no effect on cultural resources. Deteriorating air quality could be an adverse effect to cultural resources, especially resources having visual values such as historic landscapes. Efforts to control air pollution would be beneficial to visual aspects of cultural resources. In some areas dust, such as from county roads, could cover archeological sites making them more difficult to recognize and protect.

Generally management of candidate plant species would have no effect on cultural resource values. The protective mandates proposed for candidate plant habitat could also result in beneficial protection for cultural resources. There is the remote possibility that an archeological site needed for research purposes could be home to a threatened or endangered plant thus precluding the site's excavation. Should such a case ever develop, the rare plant resource would likely take precedence over the proposed scientific work.

Promoting understanding and appreciation of our heritage, as reflected in cultural resources, can result in adverse effects because the resource becoming more visible and susceptible to vandalism, looting, and other unauthorized uses.

Data recovery mitigation efforts would inevitably result in destruction of some archeological sites albeit under scientific study the sites are still destroyed. Some recordation techniques, such as making rubbings of petroglyphs, can be detrimental to the resource. Scientific data recovery whether in the context of Section 106 compliance or purely for scientific purposes could have the beneficial effect of increasing our knowledge of the resource and consequently lead to better management strategies.

Surface disturbance resulting from paleontological research and associated collecting of fossils under BLM permit could adversely effect archeological and historical sites.

Collection of invertebrate paleontological specimens inevitably diminishes the scientific data base. Collection of paleontological resources in a scientific context could have the beneficial effect of increasing our knowledge of the resource and consequently lead to better management strategies.

Fire suppression commensurate with resource values would generally be beneficial to cultural resources. However, fire could adversely affect cultural resources. Suppression activities, such as heavy equipment use and chemicals, could also damage cultural resources. It is not anticipated that a large number of sites would be affected due to the small number of fires expected to occur. Fire suppression could be necessary to save historic structures, wood alignments such as prehistoric drivelines, and prehistoric structures such as wickiups. Use of chemical fire retardant containing dye could damage rock art sites and historic inscription sites. Standard practices for dealing with cultural resources in a fire suppression scenario, including post-fire Class III inventory, could lead to the beneficial effect of increased data and better understanding of the cultural resource.

Timber harvesting and construction of associated roads, landings, etc. could destroy an undetermined number of cultural resources. Activity as a result of firewood cutting, post and pole harvest, and Christmas tree cutting could have indirect impacts on cultural resources by increasing the potential for vandalism and looting damage from vehicle traffic.

Construction and clean up of landfills could destroy sites. Dump sites associated with historic sites could become illegal hazardous waste dumps thereby necessitating their destruction in order to clean up hazardous materials. It is impossible to predict which sites could become illegal waste dumps.

Clean up of illegal hazardous waste disposal sites could result in the destruction of cultural resources. There may be no way to mitigate these impacts and the need to protect human health is obviously paramount. However, cultural resources should be taken into account and effects mitigated if it is practical.

Emergency hazardous waste clean up situations could result in loss of cultural resources.

No significant impacts are foreseen from land disposal, retention, and acquisition actions given the fact that Section 106 compliance would have to be achieved in any land disposal action. There would be substantial beneficial effects from acquisition of lands that would add to BLM comprehensive management of cultural resources.

Generally withdrawals and special status classifications would have protective effects to cultural resources.

Confinement of major transportation and utility line rights-of-way to windows, and ROW concentration areas would have the beneficial effect of minimizing potential impacts to significant cultural resources.

Acquisition of access to cultural sites on BLM lands would benefit cultural program.

Upgrading historic roads or trails could alter their historical integrity.

Impacts to cultural resources caused by livestock grazing include minor physical disturbance to surficial cultural resources caused by trampling and erosion. Riparian areas and historic routes of passage are the most sensitive cultural resource areas subject to grazing impacts.

Construction of watering sources, fences, etc., could destroy sites. Livestock rubbing on trail markers, petroglyphs sites, etc., could damage the cultural resources. Livestock training along fences can cause trampling of sites. Livestock seeking shelter and shade in standing historic structures could damage the integrity of the structure as well as its historical ambience.

Exploration operations could impact cultural resources.

Extractive operations could destroy cultural resources.

Impacts to paleontological resources from mineral activity could increase. The impact would result from earth disturbing activities such as surface mining, road building, pipeline construction, construction of well pads, evaporation pits, ponds, and buildings. Fossils could be destroyed from these surface disturbing activities, resulting in the potential loss of rare, valuable, and scientifically significant fossils. Potential loss is most likely to occur in areas such as the badland areas of the Washakie Basin and the Green River Basin and in certain areas in the northern part of the Green River Basin (in outcrops of the Bridger Formation, parts of the Wasatch Formation, and the lowest 100 feet of the Laney Shale).

The Steamboat Mountain region is also of particular concern to Native Americans for spiritual and religious purposes. Intensive development of coalbed methane in the Steamboat Mountain area could be particularly adverse to cultural resources. Development of coalbed methane elsewhere in the planning area would have generally the same effects as development of oil and natural gas.

Limiting geophysical exploration in critical areas would have beneficial effects to cultural resources as less surface disturbance would occur.

Geophysical operations within the aboriginal quarry site could seriously distort the prehistoric extraction pits and associated features within the site making it impossible to study scientifically.

Extractive operations could destroy cultural resources.

Continuance of existing coal operations would have no impacts on cultural resources beyond those that have already been mitigated or are being mitigated by ongoing plans already approved.

Historic mining sites are often especially vulnerable because they targeted the same resource then as present day coal developers.

The area around North and South Table Mountains, Natural Corrals, and the canyons north of Rock Springs, i.e., Cedar, Pine, Long, Deer, and Crooked Canyons are all known to have high densities of prehistoric sites (based on BLM Class II inventories as well as an inventory done on behalf of Rocky Mountain Energy) and any coal development would cause an impact.

Construction of additional surface support facilities for coal and sodium mining, including ponds for water disposal, could destroy sites.

The most important cultural concerns in the sodium potential areas are the Oregon Trail in the Big Sandy area and the stone circle sites on Devil's Playground-Twin Buttes area. Throughout the area, the statewide density of archeological sites prevail.

Potential impacts and standard procedures described for coal production apply to mining other solid minerals.

Although only 61 acres of surface disturbance is projected from a sodium solution mine, the areas where development is proposed includes a playa lake-sand dune complex of known high site density. It is estimated that 12 significant sites could be destroyed.

Locatable mineral management could post special problems for cultural resources since under the 1872 Mining Act it would be incumbent upon BLM to mitigate cultural values for any approved mine operation. Furthermore, the timeframes for completing mitigation could be very short and may not allow BLM to plan annual work to take this demand into account.

There is some potential that a jadeite mine could be opened over a prehistoric source of jade used for ceremonial purposes by Native Americans, resulting in destruction of a significant cultural resource.

There is some potential for a gold mine to be proposed at the location of a historic mine which could result in destruction of a significant historic property.

Off-road vehicle use has a potential to impact cultural resources by increasing erosion and artifact collection. ORV paths can destroy integrity of historic trails and this use is considered causal use and is not subjected to the same cultural resource inventory as other kinds of development; thus, impacts to cultural resources are not avoided or mitigated. Restrictions on ORVs will thus enhance cultural resource protection. Use of snow machines has little, if any, impact upon cultural resources. Increased recreational use of the planning area may result in increased vandalism and artifact collecting.

Events such as ORV rallies and cross country races could have major impacts on the fragile kinds of cultural resources, especially sites in sand dunes that we have in this planning area.

Access to especially sensitive cultural resources such as petroglyphs is made easier by unrestricted ORV use, this increases the potential for vandalism.

Driving of heavy trucks across fragile surfaces (i.e., sand dunes) can cause damage to sites including destruction of vegetation and accelerated erosion.

Management of recreation on public lands would generally be beneficial to cultural resources by educating and sensitizing people to cultural resource values and managing their use of the land.

Interpretation and other recreation management of specific cultural resource sites could have the beneficial effect of demonstrating management presence and sensitizing the public to resource values.

Recreation support facility construction can destroy sites. Additional human presence in areas of petroglyphs and other sensitive sites can lead to increased vandalism, artifact collecting, etc.

Generally, prescriptions for vegetation resource management would have no effect. Improved vegetative density and diversity would prevent erosion and thus be beneficial in preventing erosion of archeological sites.

Vegetation manipulation by burning and mechanical treatment can impact cultural resources by increasing erosion and altering the physical remains. For historic structures, burning may destroy the flammable historic resource. For a controlled burn in an area of low potential for historic structures, inventory usually occurs after the burn, when the greatest visibility of the surface is obtained. The burn may have an important benefit because significant cultural resources, previously unknown (because of lack of surface visibility) would be identified by post-burn inventory.

Chaining or large area ground disturbance could cause major damage.

Generally, visual resource management would have only beneficial effects. Measures to protect visual resource values would also protect the visual aspects of some types of cultural resources such as historic landscapes. Visual intrusions, such as gas fields, can alter the setting of petroglyphs, vision quest sites, and other sites sensitive to Native American concerns.

Generally, land management decisions that lessen natural erosion or that prevent actions that would accelerate erosion would benefit cultural resources.

Generally, management implemented to improve watershed quality would equate to less erosion which would benefit cultural resources. Occasionally, watershed and cultural resources may both be at risk in the development of facilities such as oil and gas ells, pipelines, or access roads. At times, it may be impossible to avoid a significant cultural resource without placing a facility in a location that would be detrimental to watershed. In these cases the values must be weighed and it may be necessary to conduct data recovery or other mitigation to the cultural resource, or even to allow it to be destroyed in order to protect the watershed values.

Generally, activity associated with wild horse management would have minimal potential to adversely affect cultural resources. Furthermore, wild horses add a certain aesthetic continuity to management of cultural resources associated with Plains Indian culture and settlement of the American west. There is minimal potential for horse traps, corrals, trampling by horses and truck traffic to destroy sites.

Construction of wildlife and fishery management facilities could have a small potential to damage sites. Chaining and other actions causing large areas of surface disturbance could destroy many sites. Generally though, habitat actions do not conflict to any great extent with cultural resources.

Unavoidable Adverse Impacts

Unavoidable adverse impacts occur when the inventory preceding surface-disturbing activity fails to locate significant cultural or paleontological resources, or when the significance of these located resources is not recognized. Illegal collecting and vandalism result in unavoidable adverse impacts.

Short-Term Use Versus Long-Term Productivity

The primary avoidance strategy applied in cultural resource management stresses the long-term productivity of the resource. Short-term use of prehistoric and historic sites implies excavation by qualified persons. This use is inherently destructive in nature, but the scientific knowledge obtained by study of excavated materials offsets this loss and is productive in the long-term. Unauthorized removal of cultural and paleontologic resources, a short-term use, results in permanent loss because these resources are nonrenewable. Short-term use of the historic trails by interested parties may result in limited degradation of this resource in the long-term, because of alteration of the trails themselves or of their surrounding environment.

Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitments of cultural and paleontologic resources are made when an effect occurs (36 CFR 800.3(b)). This effect is adverse unless mitigated by the appropriate data recovery program. If a cultural resource is deemed significant, in part because of its environmental setting (as in the case of historic trails), and that environment is permanently altered, an irretrievable commitment results.

SOILS

Under all alternatives, operators determine moisture (muddy) conditions, often after serious soil disturbance damage has occurred from truck-mounted operations. Minor soil compaction rates from vehicular traffic during dry periods compounds the problem and results in channelized ruts. Excessive compaction and ground cover loss result when soils are saturated and subjected to truck operations. Existing management practices allow incidents of vehicular damage and accelerated erosion due to compaction and ground cover loss to continue, especially during the spring and fall of the year.

Field observations indicate that reclamation of slopes from 15 percent to 30 percent is difficult and such slopes have not been consistently reclaimed.

If reclamation procedures are properly designed prior to disturbance, implementation of such procedures should yield more successful results in the future.

Irretrievable soil loss would be expected from some sites within this slope range, past the normal revegetation period (if reclamation is unsuccessful). The impacts from one well during a year (well-year impacts) and total soil erosion would increase. Failure of contractors to adhere to the standard stipulations compounds the problem and contributes to reclamation failure and increased time of exposure to erosive agents.

Use of native species in revegetation efforts often leaves a site exposed for several seasons until desired vegetation and density is achieved. Livestock and wildlife grazing may promote reclamation failure through utilization before stabilization. In areas with saline and alkaline soils, reclamation can be severely hampered due to poor germination and seedling establishment. All of the above limitations result in irretrievable loss of soil, dependent on time of exposure before successful reclamation.

Loss of streambank stability and direct sedimentation associated with mining would not be significant due to the small number of claims. Those areas stipulated for no surface occupancy would have no direct impacts on soils due to development constraints.

Use of constructed and designated equipment crossings in riparian areas would minimize logging impacts to streambank stability and avoid excessive bank erosion.

Due to the provision which allows the operator to determine muddy conditions, the potential for geophysical operators to cause rutting and excessive compaction would continue. This would be associated with decreases in long-term soil productivity in areas of disturbances.

Soil productivity on reclaimed areas (whether mineral or other disturbance) would be variable and dependent on soil characteristics, reclamation procedures, and treatment of topsoil. In areas with slopes greater than approximately 25 percent, reclamation that returns the disturbance to original contours would probably be poor, diminishing potential soil productivity through loss of topsoil. Grazing within newly reclaimed areas would tend to compact soil surfaces, altering germination potential and root growth.

VEGETATION

Like soil, vegetation would be affected by surface-disturbing activities. For example, a loss of plant cover would occur from construction of drill pads, roads, drainage crossings, pipelines, power lines, and other structures, as well as from forage consumption by livestock and wildlife, and loss of forage from fires.

An estimated 75 percent of the area disturbed by oil and gas related activities would be reclaimed and revegetated within 3 years after disturbance. Impacts to vegetation result from erosion, soil compaction, total removal, siltation, mechanical injury and disturbance of plants, and competition from species that invade disturbed sites.

Although sites would be reclaimed to as near original condition as possible, there would be some residual impacts especially on the more sensitive or fragile areas. For example, reclamation could result in a change in aspect. Even well established vegetation may not completely match the surrounding native plant community.

There would continue to be a loss of timber because of mortality under all alternatives. A portion of the timber would degenerate because of overmaturity and decadence, stagnation, insect attacks, and diseases (primarily parasitic mistletoe infestations). In unmanaged stands, old growth would continue to die and timber resource values would be lost. Where understory stands of regeneration are present, some would be infected with mistletoe and other diseases, resulting in a loss of some growth potential.

WATER DEPLETIONS AND THE COLORADO RIVER ENDANGERED FISH

There are three species of fish in the upper Colorado River system that are federally listed as threatened or endangered. They are the Colorado squawfish (*Ptychocheilus lucius*), the humpback chub (*Gila cypha*), and the bonytail chub (*Gila elegans*). The razorback sucker (*Xyrauchen texanus*) is federally designated as a Category 1 candidate species and may soon be listed as threatened. Though they currently exist only downstream from this resource area, water flows from the Upper Green River basin affect habitat for these fish downstream. Under the Recovery and Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (RIP), any water depletions within the Colorado River drainage are considered as jeopardizing the continued existence of these fish. This RIP was developed as part of a cooperative effort between the states of Colorado, Utah, and Wyoming; the Bureau of Reclamation (BOR); U.S. Fish and Wildlife Service (USFWS); private water development interests; and various environmental groups. In addition, a cooperative agreement was signed by the Governors of the States of Colorado, Utah, and Wyoming, the Secretary of the Interior, and the Administrator of the Western Area Power Administration, Department of Energy, to further implement the RIP.

Throughout the Upper Green River Basin, water depletions could occur from, but are not limited to, such activities as drilling operations, solid mineral extraction, power generation, irrigation, culinary use, hydrostatic testing of pipelines, evaporation from human-made reservoirs, water wells, etc. Past environmental analyses and biological assessments have documented impacts from such uses. Whether or not any specific action would actually result in a depletion from the surface flow of the Green River needs to be determined case by case and site specifically. To make an estimation of total water depletion from small depleting events over the next 20 years, some assumptions have to be made:

1) Only half of the reservoirs, water pits, and catchments installed under the range or wildlife programs would be assumed to affect the flow in the Green River.

2) Reservoirs, water pits, and catchments, etc. installed under the range or wildlife programs that cause a depletion would be assumed to average 0.5 acre-feet/year.

3) Reservoirs, water pits, and catchments, etc. installed under the range or wildlife programs would be assumed to be installed all in year 1 of the plan.

4) Water wells would cause a depletion if located within the floodplain or other recharge zones as delineated by the District geologist.

5) Oil and gas well drilling operations would be assumed to cause a one time depletion of 1 acre-foot per well.

6) Water used in hydrostatic testing of pipelines would be assumed to be returned to the water system, thus causing no depletion.

7) Spring developments would be assumed to deplete 0.5 acre-feet per year each, all installed year 1 of the plan, and only half of the springs affect the flow of the Green River.

8) Larger depletion events caused by things such as new trona ponds or expanded trona mining operations, new coal operations, new power plant operations, irrigation projects, large reservoirs, etc., would be assumed to be covered by separate environmental analysis and biological assessment. All coalbed methane projects would be handled in separate analysis, and estimated numbers of wells to be drilled are not included in the totals in Table A-12-1 (Summary Table for Small Water Depletions Within the Green River Drainage).

A biological assessment will be completed for the RMP which will represent the formal consultation for these activities as they impact Colorado River endangered fishes.

Based on these assumptions and the estimated activity to take place in other resource programs, Table A-12-1 (Summary Table for Small Water Depletions Within the Green River Drainage) can be compiled.

TABLE A-12-1

SUMMARY TABLE FOR SMALL WATER DEPLETIONS WITHIN THE GREEN RIVER DRAINAGE

Activity	BLM Initiated (all alts.)	Preferred	Other Project Proponents		
			A	B	C
Reservoirs (#)	43	None	None	None	None
Water Wells (#)	7	Unknown	Unknown	Unknown	Unknown
Spring Dev. (#)	8	None	None	None	None
Oil & Gas Well Drilling (#)	None	1,206	1,234	2,232	1,202
Irrigation	None	None	None	None	None

Activity	BLM Total Depletion (all alts.)	Preferred	Other Water Proponent Total Depletion		
			A	B	C
Reservoirs	215	None	None	None	None
Water Wells	"but for" clause	Unknown	Unknown	Unknown	Unknown
Springs	40	None	None	None	None
Oil & Gas Wells	None	None	None	None	None
Irrigation	None	None	None	None	None
Total (acre-feet)	**255**	**1,206**	**1,234**	**2,232**	**1,202**
AVERAGE ANNUAL DEPLETION	**12.75**	**60.30**	**61.70**	**111.60**	**60.10**

WATERSHED

Generally, the same activities that affect soils also affect surface water. Soil disturbances that cause erosion also increase sediment delivery to surface water. Since the resource area is in the Green River drainage, a minimum of 10 percent of all erosion occurring is assumed to be delivered to the Green River.

Increased sedimentation would degrade water quality and affect the whole food chain of aquatic life, from plants to invertebrates to fish. Sedimentation also destroys fish spawning habitat, eggs, and fry, as well as invertebrates which form the foundation of the aquatic food pyramid. Water temperatures would increase and dissolved oxygen concentrations be reduced, both of which would cause direct mortalities to fish and other aquatic life.

Some produced water discharges from oil and gas operations create additional aquatic habitat and make additional water available to irrigation. However, quality of discharged water may degrade the water quality of the receiving ephemeral or perennial stream enough to preclude its use for municipal drinking water, wildlife, recreation, and irrigation purposes. The quality of produced water discharges is required to meet or exceed the State of Wyoming Chapter VII Water Quality Regulations.

A potential impact on surface water could also come from oil spills. An oil or salt water spill entering a live water body could have a significant and long-lasting effect by making the water unsuitable for domestic livestock, wildlife, agricultural, and industrial uses. The impact from a spill, if unchecked, could extend for miles throughout many drainages.

Oil spills and soil related chemicals entering aquatic habitats coat stream bottoms and riparian zones and the chemicals contaminate the water. This could kill fish and wildlife directly, cause chronic sickness among animals, or cause wildlife to move out of the affected areas. Affected wildlife includes birds and aquatic invertebrates, fish, and other cold-blooded animals which inhabit or depend upon the riparian zone for survival. Warm-blooded mammals such as beaver muskrat, and mink are probably harmed through contact or ingestion. Oil spills also cause a loss of feeding and spawning habitat for fish.

Ground water contamination during drilling operations could occur if circulation of the drilling materials is lost or water-bearing formations are improperly cemented and cause interaquifer mixing. Ground water contamination could also occur due to blowouts and improper fracturing of hydrocarbon formations. Aquifers that have been contaminated in the past generally do not improve and would remain in the same condition.

Freshwater aquifers could be contaminated by surface-disturbing activities due to a lack of inventory that specifically identifies their characteristics.

Beaver activity in many drainages can become so intense that many of the aspen stands are removed for beaver dam construction. The results of such activity can effectively reduce the evapotransportation capabilities of many watersheds thereby increasing the magnitude of runoff events. This increase of runoff in many instances can be large enough to initiate channel incision and degradation.

WILDLIFE MANAGEMENT

General Impacts and Relationships

Fish and wildlife populations are dependent upon the continuing presence and usability of crucial habitats in adequate quantity and quality for long-term maintenance. The most severe impacts resulting from livestock grazing and surface disturbance activities have been long-term or permanent physical removal of habitat, long-term changes in habitat structure (i.e., vegetative composition), and creation of habitats of little value to wildlife. For fish and other aquatic species, degradation of water quality through sedimentation, spills, thermal pollution, etc., could result in substantial habitat loss.

If these losses occurred in crucial habitats or in habitats that provide buffer zones for crucial habitats, significant long-term reduction in the populations of affected species would occur. In the process, the condition of adjacent, undisturbed crucial habitat could deteriorate as a result of excessive use by displaced animals. This could cause reduced overall carrying capacity, further depressing wildlife populations.

Since precise predictions cannot be made about where future surface disturbing activities will occur, predictions cannot be formulated as to the extent a particular big game herd, habitat site, sage grouse population, etc., would be affected by habitat loss. Through past experience, some reasonable estimates can be made.

Adverse wildlife impacts become more serious when they occur during critical periods of the animal's normal life cycle. All species (terrestrial or aquatic) that are subjected to intrusion or habitat alteration during critical periods of their life can be affected. Critical periods for big game are winter and parturition seasons, the breeding-nesting periods for sage grouse and raptors, spawning seasons for fish, etc. The actual dates of a critical period in any species' life cycle varies but are related to cycles of low vigor, high stress, breeding, climate, and other such factors.

Winter is the most critical period for big game animals in this region. Animals are commonly under extreme environmental stress, enduring cold temperatures, deep snow, and forage that is limited in availability and nutritional quality, all of which contribute to a negative energy balance. Under these conditions, mortality is a normal occurrence. Mortality will fluctuate significantly from year to year, depending on the severity of the winter. A base population of females carrying young will survive, but often by late winter and early spring, the number surviving and their potential for successful parturition of healthy young animals is in a delicate balance. The imposition of additional, unnatural man-caused stress, such as that inherent in surface disturbing activities and maintenance and operation activities, on wintering big game herds can cause additional adverse effects to environmentally stressed big game on winter ranges.

In addition to the impacts from habitat loss, wildlife populations may be seriously affected by activities which subject animals to excessive stress, disturbance, and displacement. A variety of human activities involved in oil and gas industry, other industries, agricultural, and recreational pursuits, can create these impacts on wildlife.

Management Practices Affecting Wildlife

The environmental consequences on threatened and endangered species are unknown. However, a biological assessment which addresses the consequences on threatened or endangered species will be completed prior to the final EIS.

Air quality should have little effect on resident wildlife populations, habits, or behavior. The residual effects of trona dust, acid rain, road dust, and other pollutants may damage wildlife habitat (soil sterilization causing loss of vegetation or altering of the vegetation community), wildlife health, and candidate plant reproductive capabilities. In this case, short-term effects may be insignificant but long-term effects could be measurable (especially in relation to browse plants, cover, and forb production). Fog, smog, or other visual pollutants may impair flight visibility and result in some mortality for migratory birds and passerines. Monitoring of emissions to alleviate air quality problems from local plants could result in beneficial impacts to wildlife.

Generally, wildlife and their habitat would benefit by greater emphasis on candidate plant species management. Lack of information on other suitable habitats and other unknown plants may cause losses to potential T&E plants.

Added protection of cultural resources would benefit wildlife and result in beneficial impacts to wildlife. Protection of designated and nondesigned trails would benefit wildlife and wildlife habitat. Restrictions on visual distance from historic trails or landmarks for disturbances could reduce capability for construction and maintenance of some wildlife protection or enhancement facilities. This could also reduce capability to do vegetation manipulation. Management of the South Pass Historic Landscape would give added protection to some wildlife habitats resulting in beneficial impacts.

No significant impacts to wildlife are likely to occur by fire management activities under the production alternative. Some adverse vegetative impacts could occur in wildfire areas where livestock grazing is not restricted following the fire. This could cause increased use by livestock in the burn areas and result in poor forage and cover reproduction and long-term reduced available forage for wildlife. Smoke and particulate from prescribed burns and wildfires could have the short-term effect of wildlife displacement.

Complete suppression of all fires in some areas (Little Mountain, Pine Mountain, Steamboat Mountain, and Hickey Mountain) could cause adverse impacts to wildlife where aspen regeneration is targeted for wildlife.

Timber harvest changes wildlife habitat by removing trees that serve different functions for different species. Timber sale design can determine the extent of impact and whether the impact is positive or adverse. Timing, size, and location of timber sales, road construction, slash disposal, and reforestation techniques all impact wildlife habitat. Other land uses that occur in addition to timber harvest can have secondary impacts to the forestry program. Roads created during logging and not closed following harvest are used for hunting, fishing and recreation access. This creates additional adverse impacts to some forms of wildlife. The intensive field development required for oil and gas production accentuates the importance of trees for security cover for certain species. Livestock use of clearcuts following timber harvest can negate the positive affect of increased forage production from canopy removal and retard reforestation efforts.

The impact of timber harvest for some species is direct and adverse (e.g., cutting a tree used by cavity nesters removes their home). For other species, the impact is less obvious and more difficult to quantify (e.g., cutting security cover for elk may also increase forage production). These instances must be evaluated individually to determine which factor is more limiting (security cover or forage).

Harvest techniques in the resource area have evolved into a silviculturally sound basis, whereby reforestation through natural processes occurs. Older clearcuts (1950s and 1960s) were larger and reforestation efforts have been hampered by changes in microclimate and inadequate reservation of leave trees for seed sources. Using modern techniques, a clearcut stand of lodgepole pine can be expected to reestablish naturally to the present density of trees, 8 to 12 feet high within 20 years. Some of the clearcuts accomplished in the early 1960s are not fully reforested despite intensive artificial reforestation efforts. These older clearcuts have created an adverse, long-term impact to wildlife that depend on trees for habitat. Conversely, modern silvicultural techniques can, while providing an initial adverse impact, in the long-term maintain healthy, growing stand of trees for desirable wildlife habitat. Forestry practices that promote successional stages (i.e., mixed aspen and fir versus monotypic fir) are more desirable for wildlife. Forestry practices that concentrate management on one economically desirable tree species and attempt to control competition from other tree and browse species can reduce habitat quality by limiting stand diversity. Stand density, as well as diversity, is an important habitat feature for some wildlife. Dense old growth timber provides values not present in younger, open stands. The size of each block of timber is also important, especially for big game security cover in areas where human activity levels are high (refer to the Affected Environment section for further discussion under elk/timber relationships).

Forested areas in the planning area are minimal and any commercial timber harvest could reduce arboreal species richness, reduce resident wildlife densities, and cause loss of hiding and escape cover, parturition areas, nesting habitats, and a potential increase in siltation of streams.

Habitat used for nesting, cover, thermal protection, forage, and escape would potentially be altered or destroyed for the long term with anticipated slow timber stand regeneration (under present precipitation and short growing season regimes). Increased stream siltation, warming of water, and lower aquatic productive potential could occur under this alternative. Selective cutting (8" DBH and greater) and clearcutting would produce long-term adverse impacts to most mature forest dependant species.

Minor forest products (i.e., fuelwood, posts and poles, wildlings, and Christmas trees) should not cause any adverse impacts to wildlife or wildlife habitat.

Priority harvesting of mature, decadent, and diseased trees could have adverse impacts to some wildlife species dependent on old growth forest for habitat.

Cumulative impacts resulting from timber harvest activities on adjacent state land and other activities such as recreation and off-road vehicle use, could add to wildlife displacement and habitat loss.

All hazardous waste sites can be detrimental to wildlife. Illegal dumps, trona ponds, phosphate ponds, oil reserve pits, etc., can result in direct or indirect mortality to waterfowl, neotropical birds, big and small game, and other mammals.

Land disposal may result in loss of crucial habitats for some wildlife species. Land acquisitions in sensitive or high value wildlife habitats could help maintain a suitable land base to perpetuate the wildlife resource.

Revoking some Public Water Reserves and other withdrawals may adversely impact riparian and other habitats by opening these areas to mineral entry. No major wildlife impacts are anticipated if we allow “carte-blanche” construction of advertising signs.

Concentration areas for utilities and transportation are not being designated but would be confined to established concentration areas. This may decrease the impact to wildlife habitat by minimizing the area of disturbance. Authorizing linear surface-disturbing activities should result in short-term loss of vegetative cover and forage and alteration of natural landscapes. Linear disturbances (rights-of-way, etc.) can result in long-term vegetative loss due to unsuccessful reclamation, lack of monitoring, and overgrazing by livestock.

Displacement by human activity is a major impact to big game and other wildlife. Human disturbance associated with the maintenance and operation of communication sites, particularly those with multiple facilities, could cumulatively stress a variety of resident wildlife. Short-term displacement of big game from winter concentration areas into adjacent winter habitat areas may cause habitat deterioration as a result of excessive use by displaced animals.

In some areas above-ground pipelines are desirable to reduce impacts to wildlife habitat (vegetation and topography). This could help reduce erosion and sediment loads to area streams. Sediment loading into the Green River is particularly a problem in the Little Colorado gas field because of the steep terrain and unstable soils. Pipelines also result in the creation of new roads which could add to the displacement of wildlife from critical habitats.

Livestock grazing removes vegetation from rangelands that also support wildlife. Impacts to wildlife include direct competition for forage, reduction in cover for smaller species, increased erosion, and long-term changes in plant composition which can result in reduced wildlife production (i.e., poor condition riparian zones and sagebrush-grass types). Range improvements such as water developments, fences, and brush control associated with livestock management also impact wildlife distribution and habitat quality. These impacts can be adverse or positive, depending on the species and characteristics of the habitat affected.

Competition for vegetation often occurs when livestock remove desirable grasses, forbs, and browse on crucial wildlife habitats. This may occur while the livestock and wildlife are sharing the same range, or livestock removes the vegetation prior to wildlife presence (i.e., cattle summering on elk winter range).

The long-term effects of changes in vegetative composition from livestock grazing and associated brush control practices are more profound than the annual removal of herbage. Selective grazing pressure and other environmental influences can favor certain plant species to the detriment of others, thus altering the composition of the plant community. Wildlife that need the plant species favored by these influences benefit. Wildlife species that require the plant species that is reduced or eliminated will decline and disappear. For example, sage grouse and mule deer habitats have generally improved from livestock grazing primarily on grass, which resulted in increased sagebrush.

Livestock grazing in riparian zones has had a more severe impact on more wildlife species due to general overuse of these crucial habitats. Big game, upland game, nongame, and fish are all affected by summer-long livestock use which allows no regrowth from riparian vegetation, tramples stream banks, degrades water quality, and eventually lowers the water table. Long-term changes in vegetative composition can include eventual conversion to dry, upland vegetation. Tree and shrub production can be limited due to livestock grazing seedlings and young plants before they reach maturity and provide vertical structure to the riparian plant community.

Allotment management plans (AMPs) would be prepared, but with no specific timeframe or date. Riparian objectives would be identified in these plans with grazing systems designed to improve riparian habitats within the Bureau's proposed timeframe. Current AMPs without riparian area objectives would need to be amended. Until riparian objectives could be developed and implemented, adverse impacts to riparian habitat would continue to occur through loss or deterioration of streambanks, a continuing downward trend in vegetation quantity and quality, and a decline in species composition and diversity.

Providing additional alternate watering facilities for livestock to relieve grazing along streams may place livestock in crucial habitats or areas which now provide high value forage and cover. These waters may also be placed on ridgetops where that habitat type and forage cannot tolerate heavy grazing, resulting in a long-term conversion in plant community. This activity could result in adverse impacts to the wildlife resource.

The oil and gas industry is a major contributor to these types of impacts because their activities are widespread throughout the resource area and they primarily work in rural areas that are often prime wildlife habitats. Their operations are often intermittent, with changing phases, making it more difficult for wildlife to adapt to the intrusions. The operations usually involve large mobile, noisy equipment such as drilling rigs, earth-moving equipment, trucks, ditchers, helicopters, snow removal equipment, over-snow vehicles, and explosives. Commonly, numerous transport vehicles and workers are involved. The major industry operations causing these types of impacts are geophysical exploration, wildcat drilling, access road development into remote sites, transport pipeline construction and related facilities, and maintenance and operation of producing well sites.

Oil and gas activities such as geophysical exploration, exploratory drilling, road building and upgrading, field development (including all types of facility and equipment construction), pipeline construction, maintenance operations, and abandonment operations could cause habitat losses. If current or increased levels of industrial activity continued for another 10 to 60 years in high-value habitat sites or important seasonal ranges, significant adverse impacts to fish and wildlife populations would occur.

Research on the effects of oil and gas activity on big game or any other wildlife is limited. Most studies that have been conducted lacked adequate controls and have been short-term baseline inventories (Seeman and Associates 1984). Studies documented big game populations displacement but precluded accurate interpretation of the effects on complex population dynamics. Hunted big game herds apparently respond more strongly to human disturbances than unhunted herds. All segments of all big game herds in the resource area are subject to sport hunting. In forested areas, elk are displaced if activities are seen within ½ mile. In desert areas, that area of displacement may increase to 2 miles or more for visual disturbance.

In those herd units where concentrated parturition areas are documented, the disturbance and displacement of female elk with young could significantly reduce survival of young. The potential for mortality to young animals is high because of the vulnerability to predation, accidents, and disease (Schlegel 1978). The first few days after birth, the ability of young animals to travel is extremely restricted. Females displaced out of preferred habitats prior to parturition may have young in unsuitable habitats, reducing the chances for survival.

Success of breeding activity on sage grouse leks and the success of nesting and brood hatching throughout associated nesting habitat can be adversely affected by a variety of oil and gas operations. Disturbances that disrupt the courtship breeding rituals on sage grouse leks may disperse grouse from historical areas, or scatter mature hens and breeding males. This may result in fewer successful nesting attempts and a short-term population reduction. Prolonged, repeated, or exceptionally disturbing activities such as blasting in prime nesting areas, can cause abandonment of nests and reductions in local populations. Habitat losses from oil and gas development in nesting areas can cause more serious long-term effects on sage grouse populations than short-term disturbing activities. Minimizing losses in annual reproduction through the use of seasonal stipulations that reduce disturbance of breeding-nesting processes in intact habitats, may help offset some habitat related losses.

Human disturbances to raptors are detrimental during the breeding-nesting season (Olendorff, et al. 1980). Each species may breed at a slightly different time. Disturbance during nesting activity can lead to nest abandonment or reduced survival of young when parents spend too much time displaced from the nest. Losses from predation and injury also occur when young raptors approaching the fledgling stage are disturbed, causing them to leave the nest prematurely. These disturbing activities often result in local populations being depressed.

Seasonal restrictions (stipulations) protect crucial habitats during the construction phase of oil and gas development. Impacts from human activity would continue to occur over the long term during the operation and maintenance phase. Some leases were offered before restrictions were required and do not have stipulations attached to them. This has had some adverse impacts to both wildlife habitats and populations.

Produced water may contain salts or other concentrations which may be toxic to small wildlife and avifauna. If unfenced, new water sources could encourage additional wildlife forage competition from livestock and encourage big game to remain on crucial habitats during the summer. Neotropical birds and small mammals could be lost if open produced waters are not netted or adequately protected.

Subsurface coal extraction is the method which would create the least adverse impact to the wildlife resource and maintain biodiversity and habitat structure in the Rock Springs Uplift. Activities disruptive to wildlife and which would remove habitat include haul roads, powerline construction, buildings, railway facilities, and parking areas. Maintenance and operation activities would continue to displace some wildlife during the life of the mine.

Strip mining eliminates habitat for most indigenous wildlife species. Long-term adverse wildlife impacts are anticipated to be reduced through eventual restoration and revegetation of strip mined areas.

Seasonal, no surface occupancy, and other stipulations are assumed to be adequate to mitigate impacts. All coal mining activities in crucial wildlife habitats would have coal unsuitability and other surface protection restrictions in place.

Existing wetlands, springs, and riparian areas would be lost during the life of a strip mine plus another 10 to 20 years during reclamation and restoration. Mitigation could replace some of these features in adjacent areas; however, adverse affects would still occur to some of the species that occupied the original wetland. Disruption of the natural terrain and eventual reclamation may not provide suitable seedbed or soils for growth of essential winter big game browse species for 20 to 50 years. This could adversely affect several wildlife species occupying the Rock Springs Uplift.

Cliff and other raptor nesting habitats may be destroyed by strip mining and may be replaced with less suitable habitat. Hunting areas, roost sites, thermal radiation cover or exposure areas may be altered so they would no longer satisfy birds of prey requirements.

Depending on successful revegetation of mined lands to grass, forbs, and some shrub species, the time for suitable habitat restoration may persist for an even longer period as access roads, railroad spurs, and powerlines remain during and following restoration of habitat. Restoring big game browse species to a "pre-development" stage is anticipated to take in excess of 20 years resulting in long-term reduction in available big game habitat.

Sodium wastewater ponds have been determined to be detrimental to waterfowl, neotropical birds, small mammals, and big game species using the areas. Toxicity and high saline levels prevent life forms from occupying areas covered by the ponds. Complete netting would not alleviate the problem of long-term soil sterility.

Sodium development is expected to increase air particulates, reduce productivity of desirable plants, and reduce visibility for avifauna. Cumulative impacts to vegetation and riparian habitats from sodium dust could have long-term adverse effects on wildlife and habitat.

Creation of new roads by ORV enthusiasts may continue to cause vegetation loss, erosion, and siltation to fisheries. Wildlife could be adversely affected on crucial winter ranges through displacement by snowmobile activity. Designating ORV use areas may help reduce damage to soil and vegetation and reduce ORV disturbance in wildlife crucial habitats such as parturition areas, strutting grounds, and spawning habitats. Closure of some unimproved roads and trails should also benefit wildlife habitat.

Vegetation treatment would increase forage production (increase in forage density and diversity) in the long term for most wildlife species resulting in beneficial impacts. A short-term adverse impact could result immediately after treatment.

Sagebrush treatments identified in crucial deer and antelope winter ranges may be undesirable as it could convert shrub communities to early succession grass habitats. Vegetation treatment on sagebrush and saltbush areas may result in forage and cover loss for 20 years or more impacting wildlife species dependent on shrub communities. Sagebrush treatments could be conducted in elk winter habitats or in small parcels so that adverse impacts to antelope and deer would be minimized. However, impacts are not anticipated to be serious because treatment would not occur unless habitat values are improved.

Prescribed burns conducted during the fall or when there is low soil moisture commonly has adverse affects on regeneration and sprouting of desirable shrub species. This may result in habitat type conversion from shrub communities to grassland. Prescribed burns conducted to meet renewable resource objectives (i.e., mosaic pattern) could enhance values for wildlife, fisheries, and entire watersheds.

On identified crucial big game habitat where mountain shrub communities are identified for treatment, fall burns could have an adverse impact to these habitats due to low soil moisture causing scarification of the soil.

A short-term adverse impact would result immediately after burns through displacement, temporary loss of vegetation, loss of soils and decreased water quality, loss of nesting habitat, and some mortality.

Long-term benefits to wildlife could be increases in grass, forbs, shrubs, or aspen in winter and summer ranges. This would benefit most big game species and could improve water quality and quantity in the long run. Other long-term benefits include an increase in preferred forage species and parturition or fawning areas for wildlife.

A long-term delay in plant recovery is anticipated on habitats treated by fire where grazing is not restricted. Following the rest of treated areas, animals commonly concentrate in burn areas, resulting in reduced plant vigor, poor residual plant cover and forage. The impacts from this could reduce winter and spring survival of some juvenile and adult big game animals.

Stipulations for visual distance disturbances could restrict construction and maintenance of wildlife developments.

Watershed management actions proposed to protect watershed values would generally benefit wildlife and wildlife habitat.

Competition between wild horses and antelope or deer could occur with available surface water. Loss of spring locations or other water sources due to excessive trampling and social behavior by wild horses may adversely impact many wildlife species. There is direct competition between horses and elk for forage which could reduce forage available, especially on elk crucial winter ranges.

All actions taken to protect designated wild and scenic rivers would be beneficial to wildlife.

Animal damage control authorization could adversely impact some wildlife species. Non-target wildlife may be impacted through Animal Damage Control activities. Reduction of predator populations results in higher fawn survival and larger wildlife populations. This can have adverse effects on wildlife habitats and the viability of some big game populations. Human activities on crucial big game winter ranges during Animal Damage Control work could increase winter stress resulting in displacement and direct population mortality. This could be potentially significant especially during severe winters.

CALCULATIONS

Locatable Impacts

Quantifiable acres were determined by assessing the potential jade mining area, the potential zeolite minable area (as displayed on geological maps) and the potential gold extraction area (derived from historic gold mining activity and claims). Wildlife habitats overlying these areas were evaluated for displacement, habitat loss or adverse seasonal impacts to selected species or categories (e.g., big game, raptors, etc.). Based upon the impact of each alternative and variations between alternatives, a percentage of acres, nests, or other habitats identified would be adversely affected.

Coal Impacts

Impact assessment was based upon past and present surface mining activities and reclamation efforts of the Black Butte and Jim Bridger coal mines. With these real situations, several assumptions can be made. Stripmining an acreage will eliminate nearly all plant and animal species over the short-term from these acres. Reclamation begins, perhaps 2 to five years following stripping. Seeding, mulching, and fertilizing the disturbed area has the short term effect of a mixture of grass, forbs, and weeds. The vegetation and habitat development must go through several stages to become suitable for pre-existing plant and animal biodiversity. The fact is that it will probably take several centuries for a stripped area to again have all the plant and animal species which occurred here during pre-mining.

The restored stripmine will have low growing grass and forbs which may only be suitable for summer grazing by some big game species. Taller shrubs which protrude above winter snow are of primary importance to sustaining big game on winter ranges. The establishment and growth of shrubs to this height is assumed to exceed 20 years after mining ceases, therefore, stripmined areas will be unsuitable as crucial big game habitat for the long-term.

Analysis for raptor nest loss considered what has happened to birds of prey on these two mine sites since 1978 and the cause and effect relationship. Pre mined raptor habitats had tall escarpments with suitable surrounding habitat to support a suitable prey base for the species of bird occupying the area. During and following mining, the tall escarpments still remained, but the prey base habitat was removed and nesting raptors left the area. Most of the mature sagebrush providing passerine bird habitat was removed, thereby altering desirable prairie falcon prey habitat. Richardson's ground squirrels are slow coming back to reclaimed areas and this dramatically affects desirability of the area by ferruginous hawks and their successful nesting.

Oil and Gas

(CALCULATIONS used to arrive at acres of displacement for Nitchie Gulch):

Multiply the miles figure by ½ mile distance either side of road (displacement and effected vegetation) = 640 acres X Miles = total disturbance. This value is multiplied by the percent of crucial winter range, not counting overlapping acres by different species. The error in the figure relates to a pad (3.5 acres) in place of a linear disturbance.

EFFECTS OF FIRE MANAGEMENT ON PLANT COMMUNITIES

Elevational range extends from about 6,000 feet to over 8,500 fee. Precipitation varies from about 7 to 14 inches. Soils are shallow on the ridges but deeper and more productive in the valleys. Major plant communities include high and low density sagebrush, juniper, greasewood, and saltbush.

Sagebrush-Grass

Basin big sagebrush, Wyoming big sagebrush, and mountain big sagebrush grow alone or in combinations. Commonly, basin big sagebrush grows in deeper soils, mountain big sagebrush is at higher elevations, and Wyoming big sagebrush occupies soils with a root restricting layer or rock. All three subspecies of big sagebrush are easily killed by fire. Several needlegrasses (subalpine, Letterman, and needle and thread) may be present; all are initially reduced by fire but recover, and production may increase over preburn levels in 10 to 12 years. Recent evidence suggests that green needlegrass is not harmed by fire in Wyoming. Season of burning and plant size are probable links to needlegrass damage; June and July fires are most damaging, and large plants are harmed more than small plants. Bluebunch wheatgrass is less sensitive to fire; it normally recovers within two years and may double preburn production within five years. Idaho fescue is normally reduced by summer wildfires, especially on marginal sites, but recent evidence indicates that damage from fall prescribed burns may be less than indicated. Basin wildrye is retarded by early summer fires but unharmed by fall prescribed burns; a fall, 1983 prescribed burn west of Kemmerer resulted in wildrye greater than six feet tall, increased seed stalk production, and no apparent reduction in basal area by July 1984.

Aspen

Aspen is a self-perpetuating climax plant on some sites but is probably seral to shade-tolerant conifers on most sites in the resource area. On seral sites, it is dependent on periodic fire or other disturbance to induce suckering and remove conifer competition. The general response to burning is an eruption of suckers (up to 30,000 or more per acre) for one to three years, after which suckering ceases and the clone begins to mature. On seral sites managed for wildlife habitat, topkilling with fire is necessary to stimulate accessible, high quality browse.

Mountain Shrub

A complex mountain shrub community exists on the resource area. Dominant shrubs include mountain snowberry, antelope bitterbrush, Utah serviceberry, true mountain mahogany, curlleaf mountain mahogany, and several species of currants. Understory species may include a rich mixture of forbs and thickspike wheatgrass, Idaho fescue, timothy, and mountain brome. Horsebrush, rabbitbrush, and broom snakeweed are minor components that usually increase after burning. These communities are temporarily (1 to 12 years) retrogressed by fire but the long-term (10 to 30 years) effect is increased forage and browse production. Soil erosion problems, even on slopes greater than 40 percent, have not been reported in Wyoming. Of the more palatable shrubs, only antelope bitterbrush is usually harmed; however, the Rock Creek prescribed burn west of Kemmerer (September 1983) resulted in about 66 percent of the bitterbrush resprouting on that site. Most mountain shrub communities need protection from fire only where they exist as limiting, crucial winter range. Even then, planning would allow portions to be burned while reserving the remainder for immediate wildlife needs.

Willow

Willow communities are usually riparian and not exposed to fire except during drought years. Willow communities are extremely tolerant and most sprout vigorously. Burning willows is detrimental only in that thermal cover is removed along streams, ponds, and reservoirs. Burned willow communities are attractive to moose and may be overbrowsed if small areas are burned or the moose population is large. Domestic livestock also abuse willow communities; therefore, willows may need protection for one to three years after burning to allow recovery.

Conifer

The acreage classified as forestland includes lodgepole pine, Douglas-fir, limber pine, subalpine fir, and Englemann spruce; these trees may occur as relatively pure stands or as mixed stands. The true firs and limber pine are very sensitive to fire and are easily killed by cambial damage or crown scorch. Lodgepole becomes more susceptible to mountain pine beetle attack, windthrow, and wildfire within 100 years of stand establishment. Lodgepole is very susceptible to stand-replacing fires and is easily killed, but regenerates rapidly and prolifically. Douglas-fir is easily killed by fire from seeding through pole stages, but mature trees are extremely fire resistant. Englemann spruce and subalpine fir commonly occur together at elevations above 9,000 feet. They are both thin-barked and easily killed, but reestablish quickly on north-facing slopes. They may succeed initial establishment by aspen or Douglas-fir on south slopes.

Low Sagebrush

Common low sagebrush communities consist of relatively pure stands of black sagebrush, alkali sagebrush, or low sagebrush. Various annual and perennial forbs are present. These communities often do not support sufficient fine fuel or sagebrush cover to burn. If they do burn, all three sagebrush species are easily killed but grasses recover quickly. These sites usually are not productive and, therefore, are not good candidates for prescribed burning or rehabilitation after wildfires.

Juniper

Juniper communities often have a high frequency of lightning ignitions but lack of surface fuel prevents fire spread. Trees shorter than four feet are easily killed by surface fires if sufficient fuel is available at the base of the tree, but large trees are relatively fire resistant. Crown fires are possible when canopy cover exceeds 40 percent. Juniper does not sprout.

Greasewood

Localized saline areas support greasewood communities that may include fourwing saltbush and saltgrass. These communities are not of concern in fire protection and rarely produce cost-effective prescribed burns. Some decadent communities may benefit from fire, fire plus chemical sprout control, or fire plus reseeding. Seeding is risky, however, because few grass species are productive on these sites. Short-term removal may be preferred over unavailability of understory.

Meadows

Wet meadows are often dominated by sedges and rushes, and may have inclusions of willow or aspen. Dry meadows often contain tufted hairgrass and several bluegrass species. There may be a benefit from burning wet meadows in western Wyoming although most are relatively fire resistant. Wet meadows may burn during dry years, and the temporary effect is a shift away from sedges and rushes toward grasses and forbs. Unless the water table is altered, wet meadows return to preburn conditions in fire to seven years. Dry meadows may be invaded by various woody species including silver sagebrush. These dry meadows benefit from periodic burning because woody plant encroachment is retarded. Dry meadows may be seral to shrublands and require periodic maintenance fires. Threadleaf sedge, which may occur in some meadows, is sensitive to fire, may require 12 to 15 years to recover, and can be eliminated by repeated burning in shorter intervals.

SUMMARY

Most plant communities in the resource area respond positively to burning. Sites in good to excellent range condition usually recover naturally to preburn conditions in one to three years, with reduced cover of non-sprouting shrubs. Grazing and other uses can be resumed in 2 or 3 years. Many opportunities exist to take advantage of this response with spring and fall prescribed burns and with prescribed fires (unplanned ignitions).

APPENDIX 13

FIGURES USED FOR GENERAL ASSUMPTIONS FOR ALL ALTERNATIVES

APPENDIX 13

STATISTICAL ANALYSIS USED TO PROJECT DRILLING ACTIVITY IN THE GREEN RIVER RESOURCE AREA

GREEN RIVER RESOURCE AREA
WELLS DRILLED PER YEAR
CONCLUSIONS
(Based on Wells Drilled between 1950 - 1989)

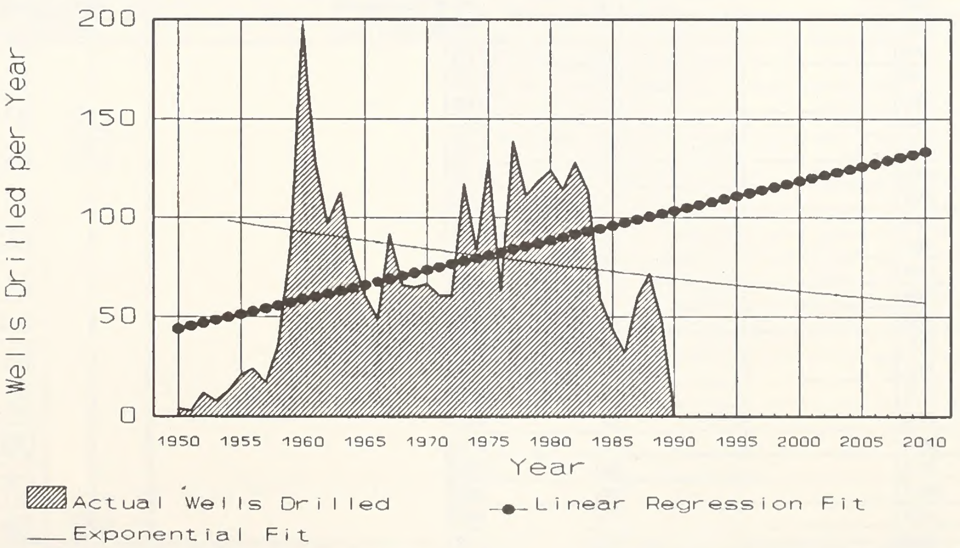
A Non-Normal distribution is obtained from a histogram of the wells drilled per year in the Green River Resource Area, from 1950 to 1989. Therefore, classical parametric statistics do not provide reasonable estimates for future projections. More robust techniques are used, which do not rely on assumptions of the data distribution.

The average number of wells drilled per year and the variability is described by the Dominate Cluster Mode (DCMODE) and Biweight Estimate (Sbi). The Jackknife Mean (J(ϕ)) and corresponding Confidence Interval (CI) provides a more robust measure than standard techniques which assume normal distribution. Still, this test is considered weaker than the DCMODE and Sbi, due to the large amount of variability in the data.

An exponential curve provides the most probable future projection of 1,328 wells drilled over the next 20 years. This curve is within the DCMODE (60.6 wells/year) ± ¼Sbi (11.3 wells/year) and the 97.5% CI.

A linear curve provides the maximum future projection of 2,485 wells drilled over the next 20 years. This curve is within the DCMODE (60.6 wells/year) ± 2Sbi (90.6 wells/year) and the 97.5% CI.

	Most Probable Projection Exponential Curve $Y = 1.45215\ E{+}10\ e^{-0.009622667\ X}$		Maximum Projection Linear Regression $Y = 1.48755234X - 2856.7024$	
Year	Well/yr	Cumulative	Wells/yr	Cumulative
1990	70	70	109	103
1991	69	138	105	208
1992	68	207	106	315
1994	68	274	112	423
1994	69	341	109	532
1995	66	407	111	103
1995	66	473	112	756
1997	65	538	114	869
1995	63	602	115	985
1995	69	666	118	1102
2000	63	729	118	1220
2001	63	792	120	1340
2002	62	854	121	1961
2008	69	915	123	1584
2000	69	976	123	1708
2008	66	1036	126	1834
2006	66	1096	127	1961
2008	59	1155	109	2090
2008	58	1213	115	2220
2009	58	1271	132	2352
2010	58	1328	133	2485



GREEN RIVER RESOURCE AREA
NUMBER OF WELLS DRILLED PER YEAR
1950 - 1989
SUMMARY STATISTICS & LINEAR REGRESSION

Data Count	Year	Actual Wells/yr	Regression Wells/yr	Cumulative Wells
8	1959	0	60	4
8	1951	2	45	60
4	1952	12	47	19
4	1953	0	48	27
5	1953	12	50	44
6	1955	41	39	61
4	1959	24	50	19
8	1959	12	4	208
8	1955	36	56	110
10	1959	36	50	203
10	1960	197	50	421
39	1968	129	60	550
41	1962	97	39	647
10	1968	111	56	19
10	1964	40	39	840
10	1965	97	48	647
39	1966	36	39	550
63	1967	48	69	1042
10	1968	40	41	1108
20	1968	65	72	1108
39	1975	97	74	208
20	1971	12	75	103
10	1977	12	77	1362
24	1955	129	39	3174
39	1975	97	39	1362
39	1975	129	81	1108
24	1975	63	83	2756
39	1977	197	50	1362
39	1975	111	60	2090
39	1975	111	39	2123
31	1955	129	89	2247
39	1955	129	60	1362
39	1975	129	39	2489
63	1955	129	93	2603
39	1975	40	75	2663
36	1955	44	46	2707
39	1975	48	39	2489
39	1975	40	39	2090
39	1975	72	50	2123
39	1975	48	127	2489
41	1990		108	103
42	1994		105	208
63	1992		63	315
41	1994		108	423
75	1994		109	532
46	1998		133	643
42	1996		132	756
39	1992		103	208
46	1998		115	985
39	1999		127	1108
39	2000		108	1108
62	2008		120	1340
50	2002		121	1362
39	1994		121	1362
55	2003		127	1708
39	2005		121	3033
39	2006		127	1362
39	2008		127	2090
55	2008		130	2220
40	2009		132	2352
63	2010		133	2489
62	2011		139	2220
63	2012		63	2756
63	1955		120	2894
65	2010		139	3033
66	2015		133	3174
39	2016		45	3316
68	2017		144	3459
69	2018		145	3605
70	2019		147	3751
71	2020		148	3899

SUMMARY STATISTICS

Sbi =	45.3	(Biweight Estimate)
MAD =	37.5	(Median Deviation from the Median)
VAR =	1970.8	(Sample Variance)
STD =	44.4	(Sample Standard Deviation)
MIN =	3.0	(Minimum)
MIDR =	100.0	(Mid Range)
MEDN =	65.5	(Median)
MODE =	65.0	(Mode)
DCMODE =	60.6	(Dominant Cluster Mode)
HARM =	27.6	(Harmonic Mean)
AVG =	73.0	(Arithmetic Mean)
MAX =	197.0	(Maximum)
COUNT =	40.0	(Sample Count)

Wells/yr	Count	%
60	2	0.0%
19	0	2.5%
19	0	2.5%
30	2	5.0%
19	0	5.0%
19	0	2.5%
60	0	5.0%
70	0	17.5%
60	0	5.0%
60	2	5.0%
69	0	5.0%
110	0	0.0%
110	6	2.5%
130	0	10.0%
110	0	2.5%
150	0	2.5%
160	2	0.0%
110	0	0.0%
110	0	0.0%
30	2	0.0%
69	0	2.5%
	0	0.0%

Regression Output:		
Constant		-2856.702439
Std Err of Y Est		42.0022384459
R Squared		0.14960528498
No. of Observations		40
Degrees of Freedom		38
X Coefficient(s)	1.48752345216	
Std Err of Coef.	0.5753191519	

GREEN RIVER RESOURCE AREA
NUMBER OF WELLS DRILLED PER YEAR
1950 - 1989

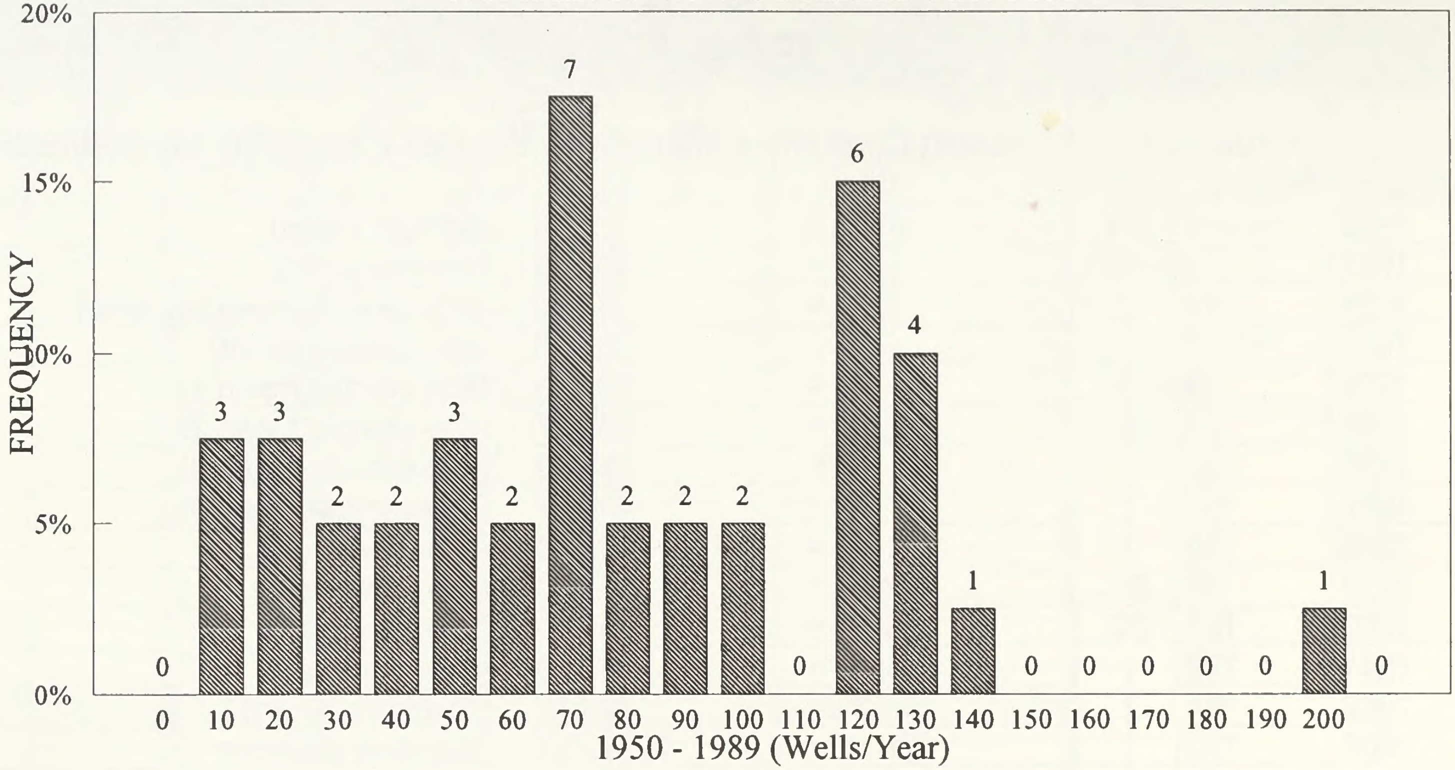
Year	Actual Wells/yr	
1950	4	Ø1
1951	3	|
1952	12	|
1953	8	|
1954	13	|
1955	21	|
1956	24	|
1957	17	|
1958	36	|
1959	86	Ø1
1960	197	Ø2
1961	129	|
1962	97	|
1963	113	|
1964	80	|
1965	61	|
1966	49	|
1967	92	|
1968	66	|
1969	65	Ø2
1970	67	Ø3
1971	61	|
1972	61	|
1973	117	|
1974	84	|
1975	129	|
1976	63	|
1977	139	|
1978	111	|
1979	118	Ø3
1980	124	Ø4
1981	114	|
1982	128	|
1983	114	|
1984	60	|
1985	44	|
1986	32	|
1987	60	|
1988	72	|
1989	48	Ø4

Robust Confidence Intervals for the Mean, based on the Jackknife:

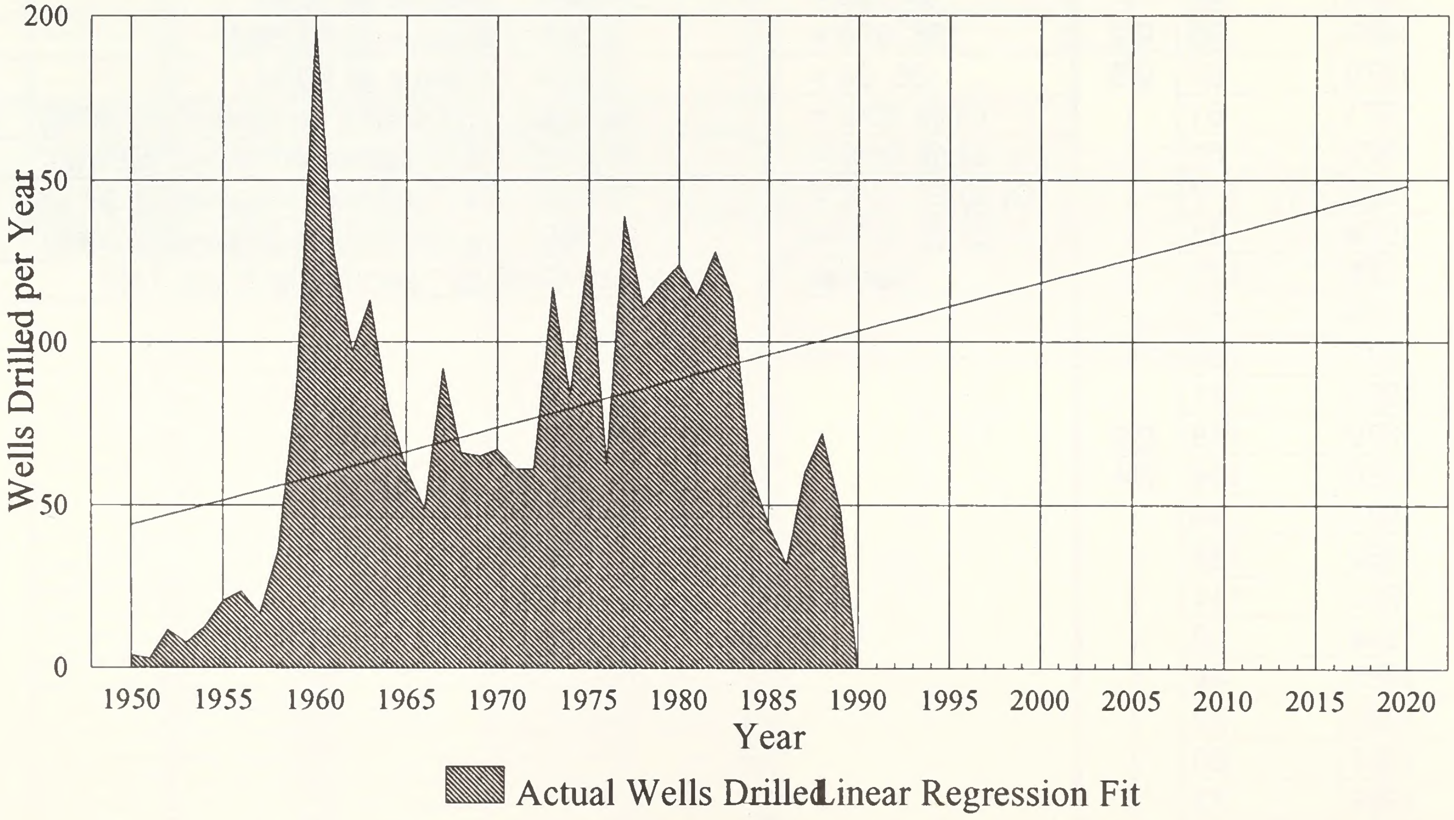
Xavg =	72.975	(sample mean)
N =	40.000	(sample count)
q =	4.000	(groups of n measurements)
n =	10.000	(sub-sample count)
Ø1 =	89.833	(sub-sample mean 1)
Ø2 =	65.667	(sub-sample mean 2)
Ø3 =	65.633	(sub-sample mean 3)
Ø4 =	70.767	(sub-sample mean 4)
j1(Ø) =	22.400	(pseudovalue 1)
j2(Ø) =	94.900	(pseudovalue 2)
j3(Ø) =	95.000	(pseudovalue 3)
j4(Ø) =	79.600	(pseudovalue 4)
J(Ø) =	72.975	(Jackknife Mean)
$(j1-J)^2$ =	2557.831	(standard deviation 1)
$(j2-J)^2$ =	480.706	(standard deviation 2)
$(j3-J)^2$ =	485.101	(standard deviation 3)
$(j4-J)^2$ =	43.891	(standard deviation 4)
t36,.90 =	1.303	(t value @ 90%)
t36,.95 =	1.684	(t value @ 95%)
t36,.975 =	2.021	(t value @ 97.5%)
t36,.99 =	2.423	(t value @ 99%)
CI @ 90% =	44.933	(± Confidence Interval @ 90%)
CI @ 95% =	58.072	(± Confidence Interval @95%)
CI @ 97.50% =	69.693	(± Confidence Interval @ 97.5%)
CI @ 99% =	83.556	(± Confidence Interval @ 99%)

(Reference: "Numerical Geology", section 9e.2, pg. 110)

GREEN RIVER RESOURCE AREA
NUMBER OF WELLS DRILLED PER YEAR

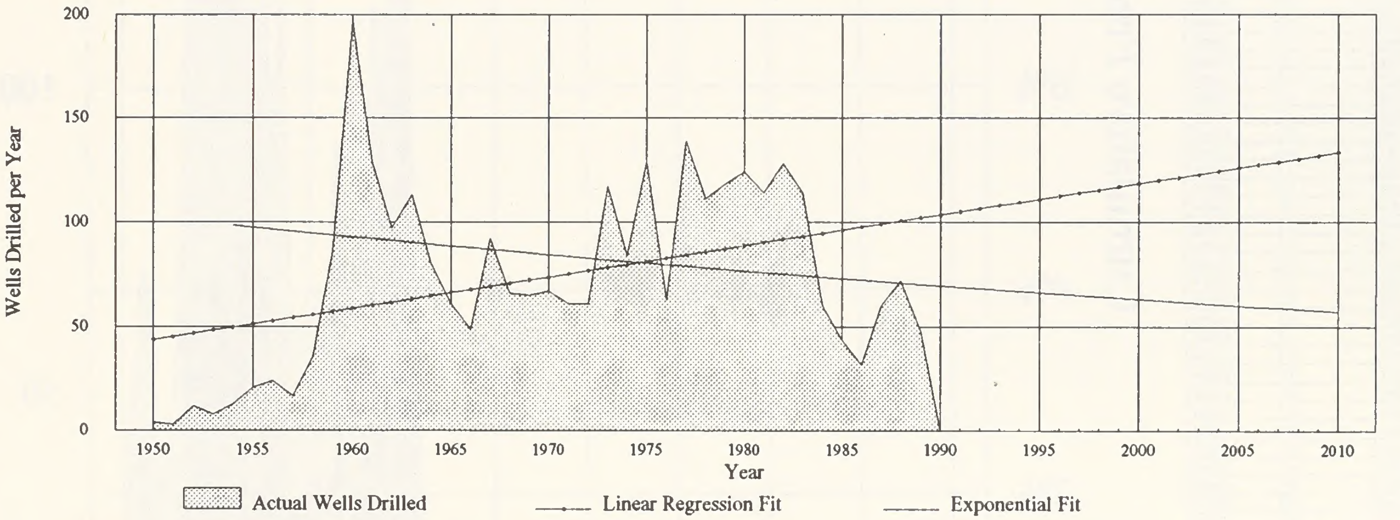


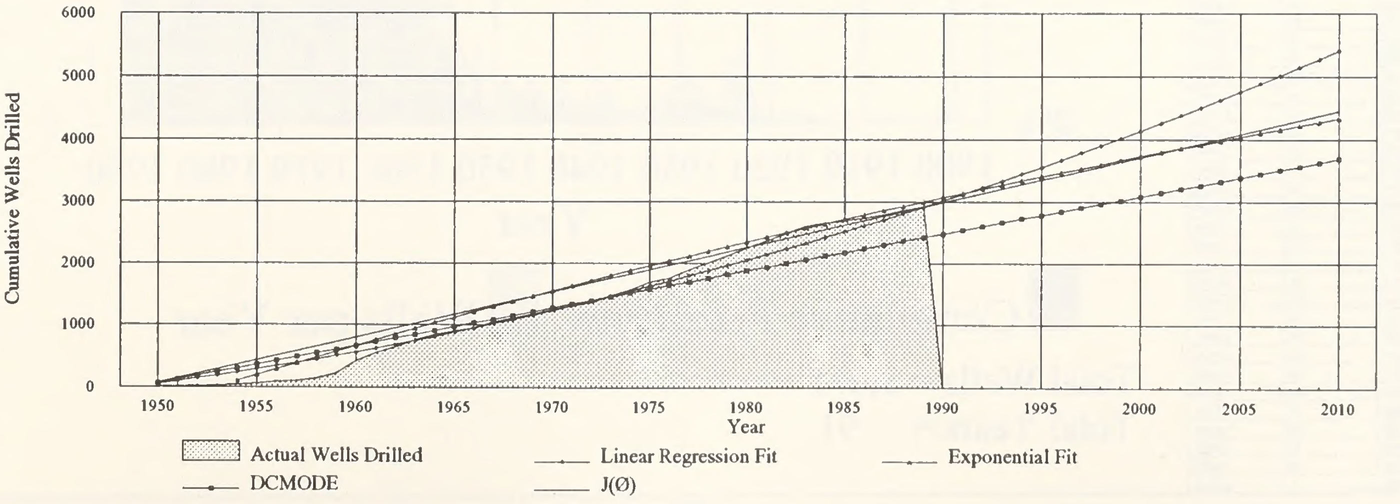
GREEN RIVER RESOURCE AREA
REGRESSION ANALYSIS



GREEN RIVER RESOURCE AREA
WELLS DRILLED PER YEAR
FUTURE PROJECTIONS
(Based on Wells Drilled between 1950 -1989)

	Linear Regression Y = 1.48755234X - 2856.7024		Exponential Curve Y = EXP(-0.009622667X) x (1.45215 E10)		DCMODE 61 wells/yr	J(Ø) 73 wells/yr
Year	Wells/yr	Cumulative	Wells/yr	Cumulative	Cumulative	Cumulative
1990	103	103	70	70	61	73
1991	105	208	69	138	121	146
1992	106	315	68	207	182	219
1993	108	423	68	274	242	292
1994	109	532	67	341	303	365
1995	111	643	66	407	364	438
1996	112	756	66	473	424	511
1997	114	869	65	538	485	584
1998	115	985	64	602	545	657
1999	117	1,102	64	666	606	730
2000	118	1,220	63	729	667	803
2001	120	1,340	63	792	727	876
2002	121	1,461	62	854	788	949
2003	123	1,584	61	915	848	1,022
2004	124	1,708	61	976	909	1,095
2005	126	1,834	60	1,036	970	1,168
2006	127	1,961	60	1,096	1,030	1,241
2007	129	2,090	59	1,155	1,091	1,314
2008	130	2,220	58	1,213	1,151	1,387
2009	132	2,352	58	1,271	1,212	1,459
2010	133	2,485	57	1,328	1,273	1,532

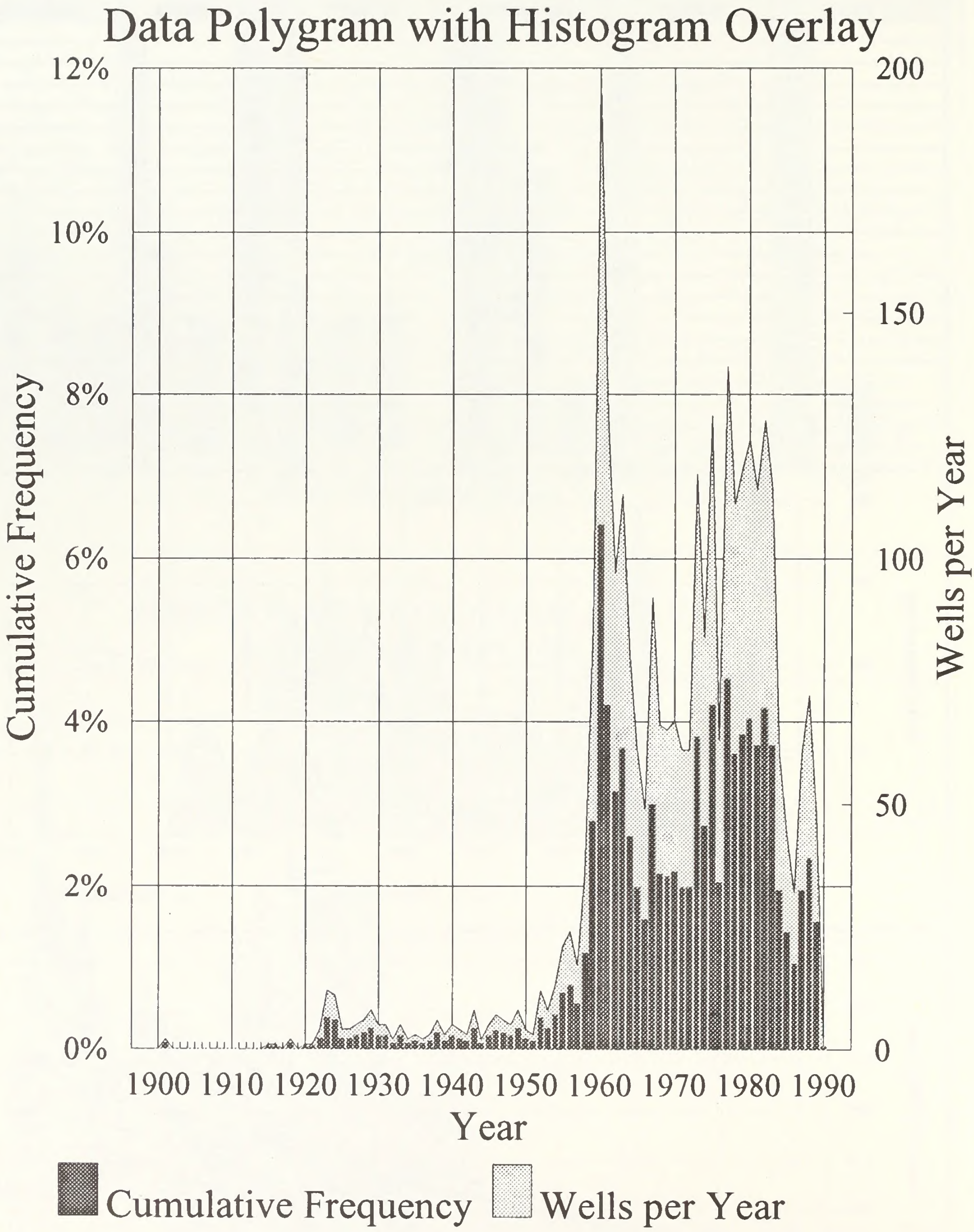




GREEN RIVER RESOURCE AREA
OIL & GAS WELLS DRILLED PER YEAR

(Source: Petroleum Information Historical Data Base)

Year	Number of Wells/yr	Cumulative Frequency
1966	0	0.000%
1982	8	0.065%
1948	0	0.000%
1955	0	0.000%
1966	0	0.000%
1948	0	0.000%
1908	0	0.000%
1982	0	0.000%
1908	0	0.000%
1906	0	0.000%
1940	0	0.000%
1982	0	0.000%
1952	0	0.000%
1982	0	0.000%
1982	0	0.000%
1955	8	0.033%
1955	8	0.130%
1982	0	0.000%
1982	2	0.358%
1948	0	0.000%
1920	8	0.033%
1982	8	0.033%
1922	8	0.130%
1948	13	6.415%
1948	13	0.358%
1928	8	0.130%
1982	8	0.163%
1948	8	0.358%
1928	6	0.130%
1982	8	0.261%
1940	8	0.358%
1931	8	0.163%
1948	8	0.065%
1933	8	0.033%
1931	8	0.065%
1948	8	0.098%
1948	2	0.065%
1952	8	0.098%
1948	6	6.415%
1982	92	6.415%
1940	8	0.163%
1948	8	0.130%
1982	8	6.415%
1948	8	0.261%
1952	2	0.065%
1948	8	0.163%
1948	8	0.033%
1952	6	0.195%
1948	8	0.163%
1949	8	0.358%
1950	8	0.130%
1982	8	0.098%
1952	92	0.358%
1955	8	0.261%
1982	13	0.098%
1955	36	0.665%
1955	24	0.782%
1982	17	0.554%
1948	36	1.172%
1982	36	2.800%
1960	118	6.415%
1982	129	4.526%
1955	92	3.159%
1982	118	3.680%
1964	30	2.605%
1955	92	1.986%
1966	36	1.596%
1982	92	0.098%
1964	36	0.358%
1982	13	0.098%
1982	92	6.415%
1982	36	1.986%
1922	61	1.986%
1982	118	3.810%
1982	33	0.358%
1975	129	1.906%
1976	13	0.033%
1982	118	4.526%
1976	111	0.098%
1982	118	0.098%
1940	118	0.358%
1955	118	3.712%
1982	17	4.168%
1955	118	0.358%
1952	-0	1.986%
1948	13	0.358%
1948	13	1.042%
1952	-0	1.986%
1988	72	2.345%
1989	48	1.563%
1990	1	0.033%



Total Wells = 3,071
Total Years = 91

APPENDIX 13

STATISTICAL ANALYSIS USED TO PROJECT DRILLING ACTIVITY IN THE LITTLE COLORADO DESERT

LITTLE COLORADO DESERT STUDY AREA
WELLS DRILLED PER YEAR
CONCLUSIONS
(Based on Wells Drilled between 1957 - 1990)

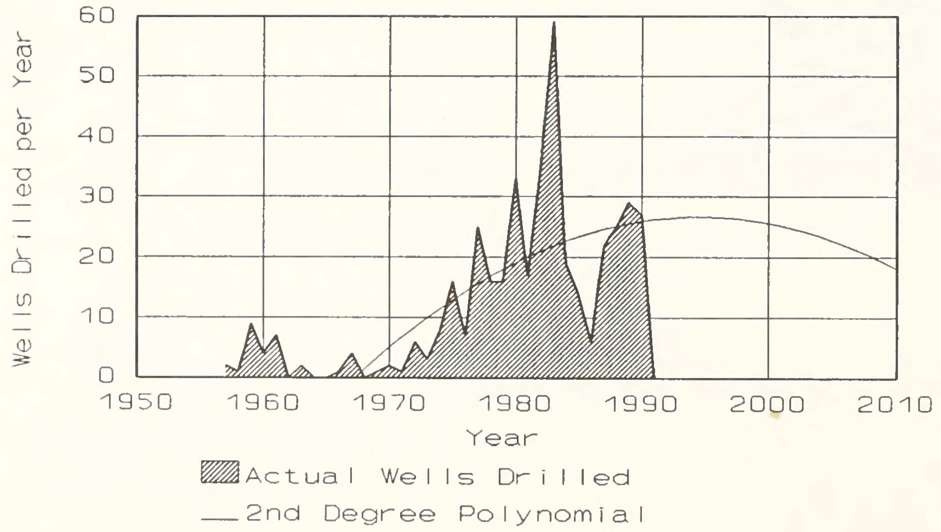
A Non-Normal distribution is obtained from a histogram of the wells drilled per year in the Green River Resource Area, from 1950 to 1989. Therefore, classical parametric statistics do not provide reasonable estimates for future projections. More robust techniques are used, which do not rely on assumptions of the data distribution.

The average number of wells drilled per year and the variability is described by the Dominate Cluster Mode (DCMODE) and Biweight Estimate (Sbi). The Jackknife Mean (J(ϕ)) and corresponding Confidence Interval (CI) provides a more robust measure than standard techniques which assume normal distribution. Still, this test is considered weaker than the DCMODE and Sbi, due to the large amount of variability in the data.

J(ϕ) provides the most probable future projection of 255 wells drilled over the next 20 years. This mean is within the DCMODE (1.43 wells/year) ± Sbi (11.66 wells/year). Note that the 90% CI is more variable than the Sbi.

A 2nd degree polynomial curve provides the maximum future projection of 510 wells drilled over the next 20 years. This curve is within the DCMODE (1.43 wells/year) ± 2Sbi (23.32 wells/year) and the 97.5% CI.

	Most Probable Projection J(ϕ) 12.15 $\frac{wells}{year}$		Maximum Projection 2nd Degree Polynomial $Y = -142{,}280 + 142.695X - 0.0357711X^2$	
Year	Well/yr	Cumulative	Wells/yr	Cumulative
1990	12.15	12	26	26
1998	12.15	24	26	52
1992	12.15	49	26	79
1993	12.15	49	27	105
1994	12.15	61	27	132
1995	12.15	73	27	158
1996	12.15	85	27	185
1997	12.15	97	26	211
1998	12.15	109	26	238
1999	12.15	182	26	264
2000	12.15	134	26	289
2001	12.15	49	26	363
2008	12.15	182	26	431
2001	12.15	170	24	363
2001	12.15	182	23	453
2005	12.15	194	23	409
2006	12.15	243	20	431
2007	12.15	243	26	453
2008	12.15	243	20	473
2009	12.15	243	19	132
2010	12.15	255	18	510



LITTLE COLORADO DESERT STUDY AREA
CRETACEOUS AGE FORMATIONS
NUMBER OF WELLS DRILLED PER YEAR
1957 - 1990
SUMMARY STATISTICS & LINEAR REGRESSION

Data Count	Year	Actual Wells/yr	Regression Wells/yr	Cumulative Wells
1	1957	2	-3.3	2
2	1958	1	-2.4	3
3	1959	9	-1.4	12
4	1960	4	-0.5	16
5	1961	1	0.5	23
6	1962	0	1.4	23
7	1963	2	2.4	25
8	1964	0	3.3	25
9	1965	0	4.3	25
10	1966	1	5.2	26
11	1967	4	6.2	30
12	1968	6	7.1	30
13	1969	1	8.0	31
14	1970	2	9.0	33
15	1971	1	9.9	34
16	1972	6	10.9	40
17	1973	4	11.8	43
18	1974	9	12.8	51
19	1975	16	13.7	67
20	1976	7	14.7	74
21	1977	25	15.6	99
22	1978	16	16.5	115
23	1979	16	17.5	131
24	1980	33	18.4	164
25	1981	17	19.4	181
26	1982	36	20.3	217
27	1983	59	21.3	276
28	1984	19	22.2	295
29	1985	14	23.2	309
30	1986	6	24.1	315
31	1987	22	25.0	337
32	1988	25	26.0	362
33	1989	25	26.9	391
34	1990	27	27.9	418
35	1991		28.9	28.8
36	1992		29.8	58.6
37	1993		30.7	89.3
38	1994		31.7	121.0
39	1995		32.6	153.6
40	1996		33.6	187.1
41	1997		34.5	221.6
42	1998		35.4	257.1
43	1999		36.4	293.5
44	2000		37.3	330.8
45	2001		38.3	369.1
46	2002		39.2	408.3
47	2003		40.2	448.5
48	2004		41.1	489.6
49	2005		42.1	531.6
50	2006		43.0	574.6
51	2007		43.9	618.6
52	2008		44.9	663.5
53	2009		45.8	709.3
54	2010		46.8	756.1
55	2011		47.7	803.8
56	2012		48.7	852.5
57	2013		49.6	902.1
58	2014		50.6	952.7
59	2015		51.5	1004.2
60	2016		52.4	1056.6
61	2017		53.4	1110.0
62	2018		54.3	1164.4
63	2019		55.3	1219.6
64	2020		56.2	1275.9

SUMMARY STATISTICS

Sbi = 11.66 (Biweight Estimate)
MAD = 7.00 (Median Deviation from the Median)
VAR = 176.97 (Sample Variance)
STD = 13.30 (Sample Standard Deviation)
MIN = 0.00 (Minimum)
MIDR = 29.50 (Mid Range)
MEDN = 7.00 (Median)
MODE = 4.29 (Mode)
DCMODE = 1.43 (Dominant Cluster Mode)
HARM = 4.34 (Harmonic Mean)
AVG = 12.29 (Arithmetic Mean)
MAX = 59.00 (Maximum)
COUNT = 34 (Sample Count)

Wells/yr	Count	%
0	4	11.8%
9	15	44.1%
17	6	17.6%
26	4	11.8%
34	3	8.8%
43	1	2.9%
51	0	0.0%
60	1	2.9%
	0	0.0%

Regression Output:		
Constant		-1852.35
Std Err of Y Est		9.835527
R Squared		0.485529
No. of Observations		34
Degrees of Freedom		32
X Coefficient(s)	0.944843	
Std Err of Coef.	0.171932	

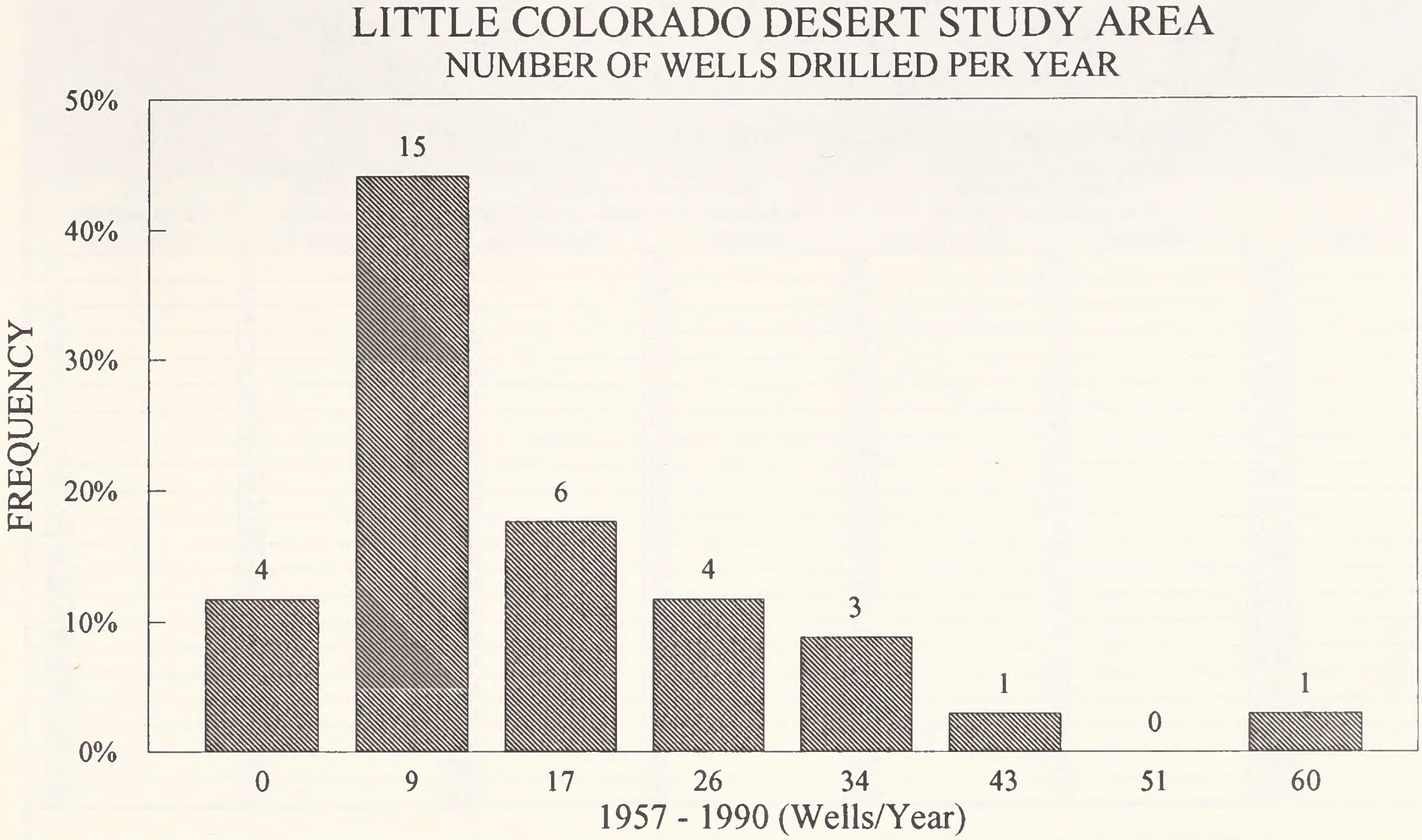
LITTLE COLORADO DESERT STUDY AREA
NUMBER OF CRETACEOUS AGE WELLS DRILLED PER YEAR

Year	Actual Wells/yr	3-Point Moving Average Smoothed Wells/yr	
1957	2		
1958	4	4.0	Ø1
1959	0	4.7	|
1960	4	6.7	|
1961	7	3.7	|
1962	0	3.0	|
1963	2	0.7	|
1964	0	0.7	|
1965	0	0.3	Ø1
1966	7	1.7	Ø2
1967	4	1.7	|
1968	0	1.7	|
1969	7	1.0	|
1970	2	1.3	|
1971	4	3.0	|
1972	6	3.3	|
1973	3	5.7	Ø2
1974	8	9.0	Ø3
1975	16	10.3	|
1976	7	16.0	|
1977	25	16.0	|
1978	16	19.0	|
1979	16	21.7	|
1980	33	22.0	|
1981	17	28.7	Ø3
1982	36	37.3	Ø4
1983	59	38.0	|
1984	19	30.7	|
1985	14	13.0	|
1986	6	14.0	|
1987	22	17.7	|
1988	25	25.3	|
1989	29	27.0	Ø4
1990	27		

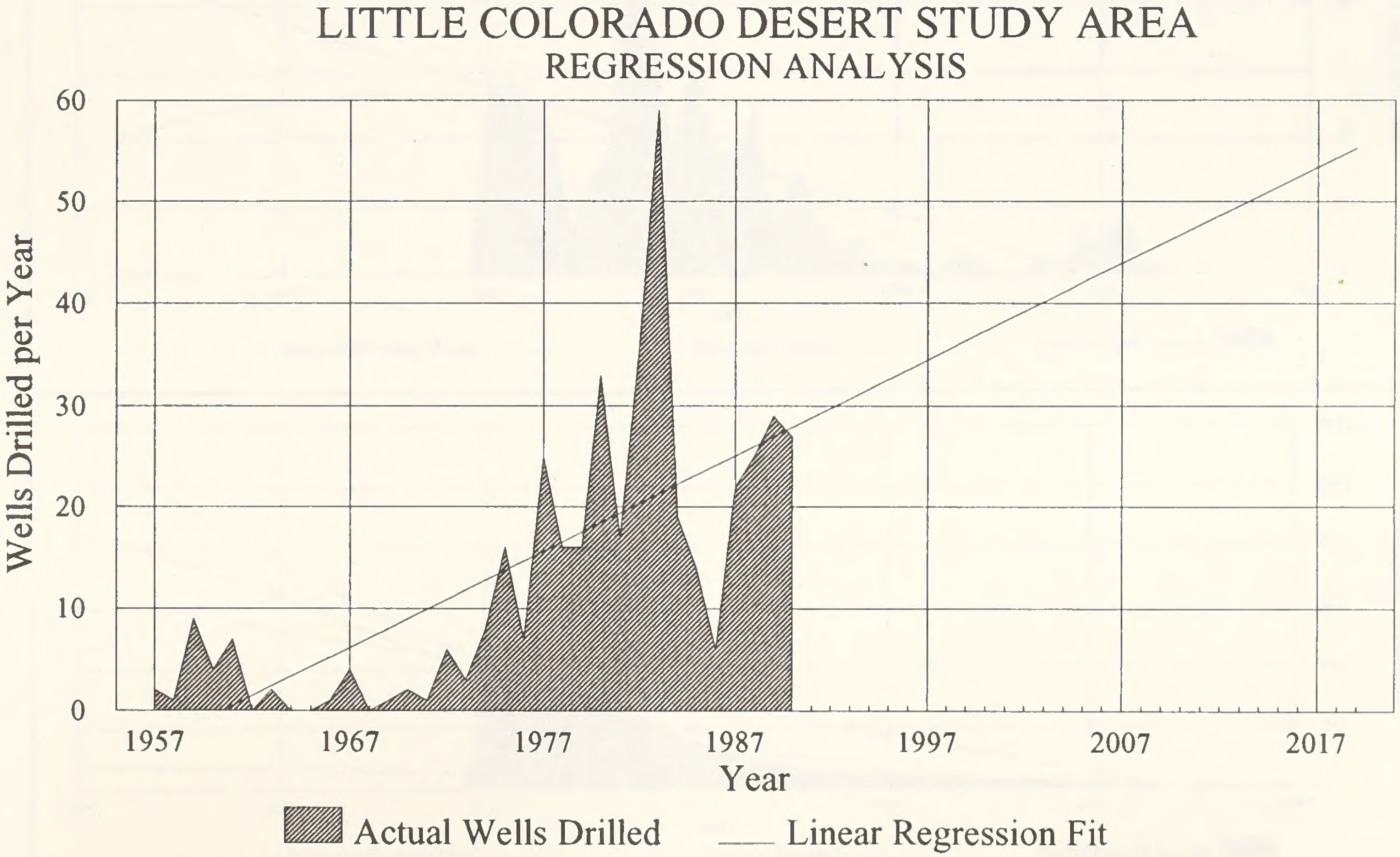
Robust Confidence Intervals for the Mean, based on the Jackknife:

Xavg = 12.15 (sample mean)
N = 32.00 (sample count)
q = 4.00 (groups of n measurements)
n = 8.00 (sub-sample count)
Ø1 = 15.21 (sub-sample mean 1)
Ø2 = 15.39 (sub-sample mean 2)
Ø3 = 10.25 (sub-sample mean 3)
Ø4 = 7.74 (sub-sample mean 4)
j1(Ø) = 2.96 (pseudovalue 1)
j2(Ø) = 2.42 (pseudovalue 2)
j3(Ø) = 17.83 (pseudovalue 3)
j4(Ø) = 25.38 (pseudovalue 4)
J(Ø) = 12.15 (Jackknife Mean)
$(j1-J)^2$ = 84.41 (standard deviation 1)
$(j2-J)^2$ = 94.66 (standard deviation 2)
$(j3-J)^2$ = 32.35 (standard deviation 3)
$(j4-J)^2$ = 175.01 (standard deviation 4)
t32,.90 = 1.31 (t value @ 90%)
t32,.95 = 1.69 (t value @ 95%)
t32,.975 = 2.04 (t value @ 97.5%)
t32,.99 = 2.45 (t value @ 99%)
CI @ 90% = 14.85 (± Confidence Interval @ 90%)
CI @ 95% = 19.23 (± Confidence Interval @95%)
CI @ 97.50% = 23.13 (± Confidence Interval @ 97.5%)
CI @ 99% = 27.81 (± Confidence Interval @ 99%)

(Reference: "Numerical Geology", section 9e.2, pg. 110)



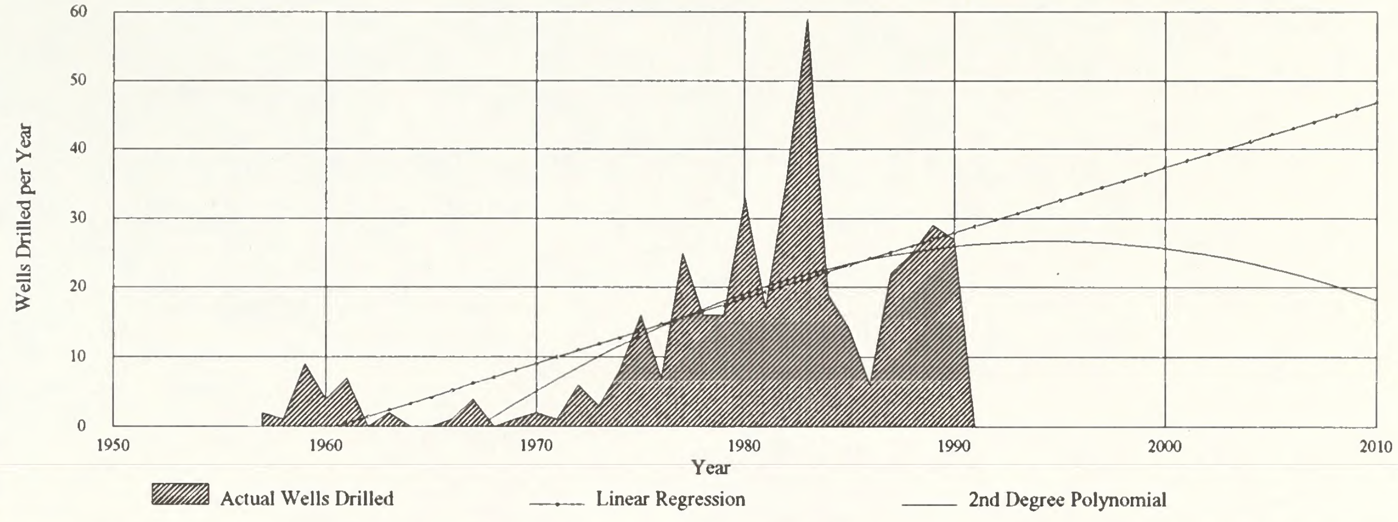
Cretaceous Age Formations

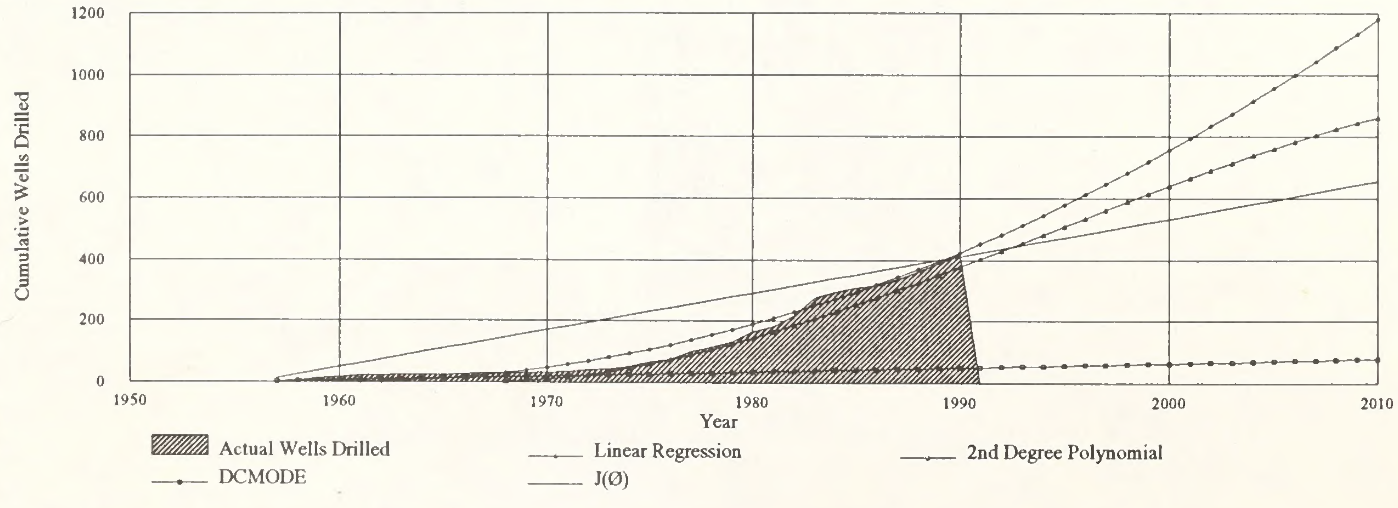


Cretaceous Age Formations

LITTLE COLORADO DESERT STUDY AREA
NUMBER OF CRETACEOUS AGE WELLS DRILLED PER YEAR
FUTURE PROJECTIONS
(Based on Wells Drilled between 1957 -1990)

	Linear Regression $Y = 0.944843X - 1852.35$		2nd Degree Polynomial $Y = -142,280 + 142.695X - 0.0357711X^2$		DCMODE 1.43 wells/yr	J(Ø) 12.15 wells/yr
Year	Wells/yr	Cumulative	Wells/yr	Cumulative	Cumulative	Cumulative
1990	28	28	26	26	1	12
1991	29	57	26	52	3	24
1992	30	86	26	79	4	36
1993	31	117	27	105	6	49
1994	32	149	27	132	7	61
1995	33	181	27	158	9	73
1996	34	215	27	185	10	85
1997	35	250	26	211	11	97
1998	35	285	26	238	13	109
1999	36	321	26	264	14	122
2000	37	359	26	289	16	134
2001	38	397	25	314	17	146
2002	39	436	25	339	19	158
2003	40	476	24	363	20	170
2004	41	518	23	387	21	182
2005	42	560	23	409	23	194
2006	43	603	22	431	24	207
2007	44	647	21	453	26	219
2008	45	691	20	473	27	231
2009	46	737	19	492	29	243
2010	47	784	18	510	30	255





APPENDIX 13

STATISTICAL ANALYSIS USED TO PROJECT DRILLING ACTIVITY IN THE GREATER NITCHIE GULCH

GREATER NITCHIE GULCH STUDY AREA
WELLS DRILLED PER YEAR
CONCLUSIONS
(Based on Wells Drilled between 1961 - 1990)

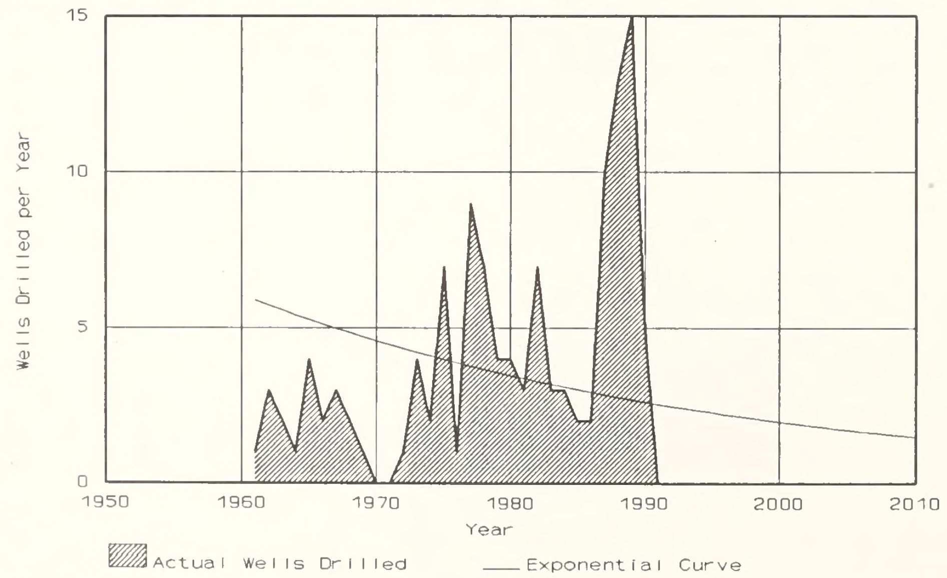
A Non-Normal distribution is obtained from a histogram of the wells drilled per year in the Green River Resource Area, from 1950 to 1989. Therefore, classical parametric statistics do not provide reasonable estimates for future projections. More robust techniques are used, which do not rely on assumptions of the data distribution.

The average number of wells drilled per year and the variability is described by the Dominate Cluster Mode (DCMODE) and Biweight Estimate (Sbi). The Jackknife Mean (J(ϕ)) and corresponding Confidence Interval (CI) provides a more robust measure than standard techniques which assume normal distribution. Still, this test is considered weaker than the DCMODE and Sbi, due to the large amount of variability in the data.

An exponential curve provides the most probable future projection of 42 wells drilled over the next 20 years. This curve is within the DCMODE (2 wells/year) ± ½Sbi (1.37 wells/year). Note that the 90% CI is more variable than the Sbi.

J(ϕ) provides the maximum future projection of 84 wells drilled over the next 20 years. This curve is within the DCMODE (2 wells/year) ± Sbi (2.74 wells/year) and the 95% CI.

	Most Probable Projection Exponential Curve $Y = 4.21927\ E{+}24\ e^{-0.0280105\ X}$		Maximum Projection J(ϕ) $4\ \frac{wells}{year}$	
Year	Well/yr	Cumulative	Wells/yr	Cumulative
1990	3	3	4	4
1990	3	8	4	8
1992	2	8	4	12
1993	2	17	4	16
1997	2	12	4	20
1995	2	15	4	28
1998	2	17	4	28
1997	2	17	4	72
1998	2	21	4	76
1997	2	23	4	70
2006	2	29	4	44
2001	2	17	4	76
2008	2	29	4	52
2003	2	31	4	56
2004	2	31	4	16
2005	2	34	4	64
2006	2	36	4	16
2008	2	34	4	72
2008	2	36	4	76
2009	2	41	4	20
2010	1	42	4	28



GREATER NITCHIE GULCH STUDY AREA
NUMBER OF WELLS DRILLED PER YEAR
1961 - 1990
SUMMARY STATISTICS & LINEAR REGRESSION

Data Count	Year	Actual Wells/yr	Regression Wells/yr	Cumulative Wells
1	1961	1	0.5	1
2	1962	3	0.8	4
3	1963	2	1.0	6
4	1964	1	1.2	7
5	1965	4	1.5	11
6	1966	2	1.7	43
7	1967	3	2.0	16
8	1968	2	2.2	18
9	1969	1	2.5	19
10	1970	0	2.7	19
11	1971	4	2.9	19
12	1972	1	3.2	26
13	1973	4	3.4	24
14	1974	2	3.7	26
15	1975	7	3.9	33
16	1976	1	4.2	34
17	1977	3	4.4	43
18	1978	1	4.6	50
19	1979	4	4.9	54
20	1980	4	5.1	58
21	1981	3	5.4	61
22	1982	1	5.6	58
23	1983	3	5.9	11
24	1984	3	6.1	78
25	1985	2	6.3	78
26	1986	2	6.6	78
27	1987	10	6.8	88
28	1988	13	7.1	101
29	1989	15	7.3	116
30	1990	5	7.6	121
31	1991		7.8	8
32	1992		8.0	16
33	1993		8.3	24
34	1994		8.3	33
35	1995		8.8	41
36	1996		9.0	50
37	1997		9.3	60
38	1998		9.3	69
39	1999		9.7	79
40	2000		10.0	89
41	2001		10.2	99
42	2002		10.5	110
43	2003		10.7	120
44	2004		11.0	131
45	2005		11.2	143
46	2006		11.4	154
47	2007		11.7	166
48	2008		11.9	178
49	2009		12.2	190
50	2010		12.4	202

SUMMARY STATISTICS

Sbi =	2.74	(Biweight Estimate)
MAD =	1.50	(Median Deviation from the Median)
VAR =	13.23	(Sample Variance)
STD =	3.64	(Sample Standard Deviation)
MIN =	0.00	(Minimum)
MIDR =	7.50	(Mid Range)
MEDN =	3.00	(Median)
MODE =	1.50	(Mode)
DCMODE =	2.00	(Dominant Cluster Mode)
HARM =	2.58	(Harmonic Mean)
AVG =	4.03	(Arithmetic Mean)
MAX =	15.00	(Maximum)
COUNT =	30.00	(Sample Count)

Wells/yr	Count	%
0	2	6.7%
1	5	16.7%
2	6	20.0%
3	5	16.7%
4	4	13.3%
5	1	3.3%
6	0	0.0%
7	3	10.0%
8	0	0.0%
9	1	3.3%
10	1	3.3%
	2	6.7%

Regression Output:		
Constant		-476.327
Std Err of Y Est		3.071064
R Squared		0.334755
No. of Observations		30
Degrees of Freedom		28
X Coefficient(s)	0.243159	
Std Err of Coef.	0.06478	

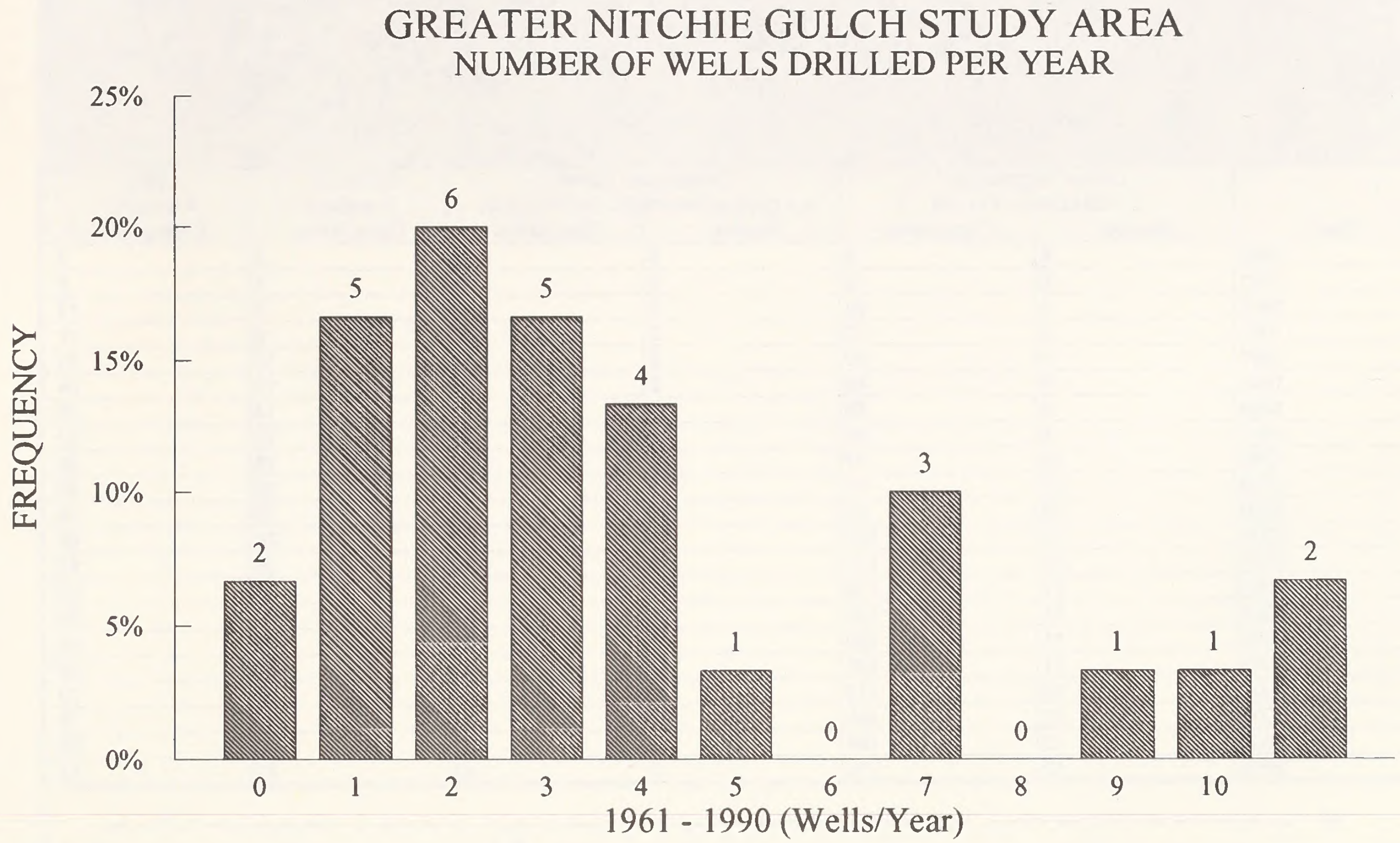
GREATER NITCHIE GULCH STUDY AREA
NUMBER OF WELLS DRILLED PER YEAR

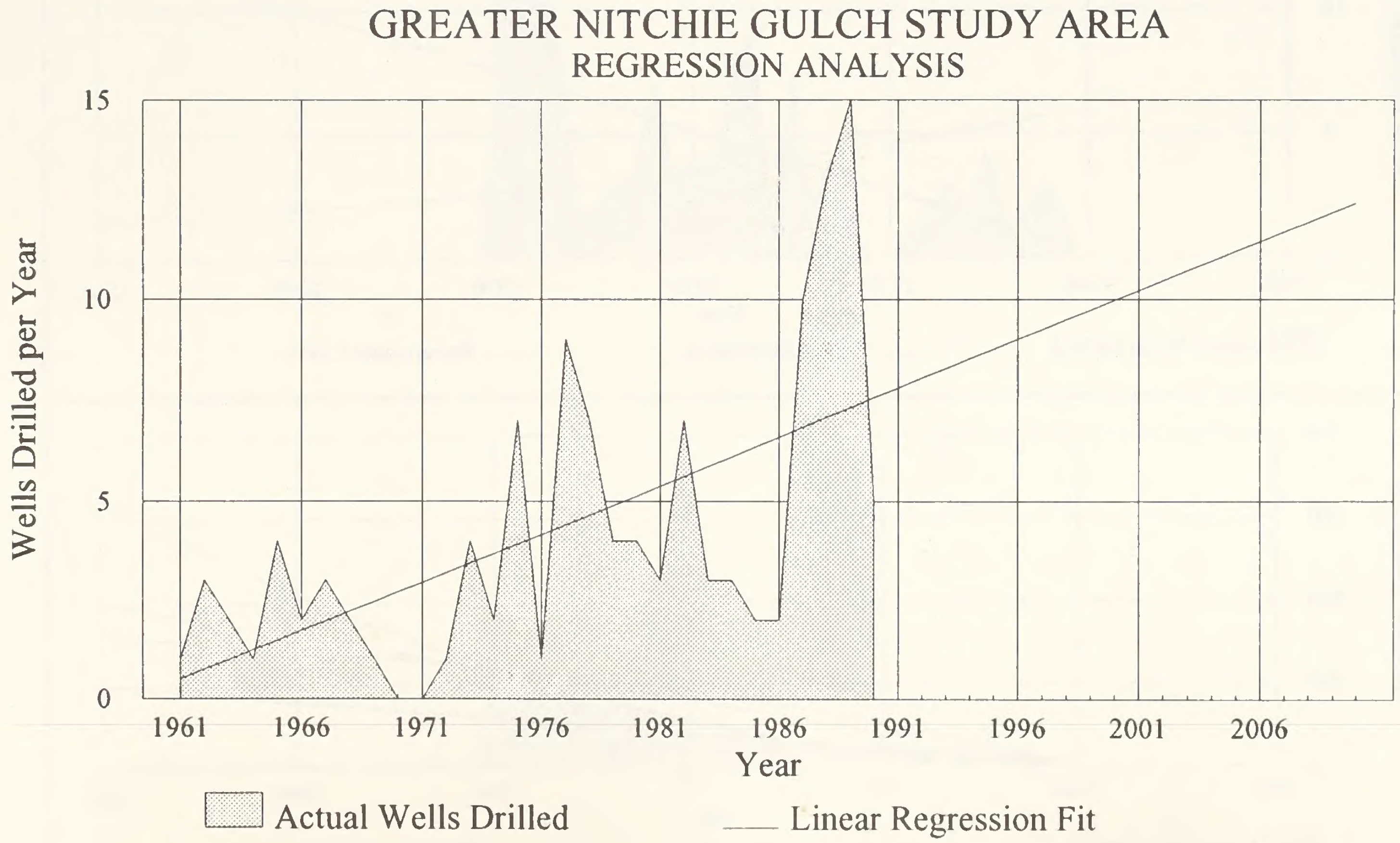
Year	Actual Wells/yr	3-Point Moving Average Smoothed Wells/yr	
1961	1		
1962	3	2.0	Ø1
1963	2	2.0	|
1964	1	2.3	|
1965	4	2.3	|
1966	2	3.0	|
1967	3	2.3	|
1968	2	2.0	Ø1
1969	1	1.0	Ø2
1970	0	0.3	|
1971	0	0.3	|
1972	1	1.7	|
1973	4	2.3	|
1974	2	4.3	|
1975	7	3.3	Ø2
1976	4	5.7	Ø3
1977	9	5.7	|
1978	7	5.7	|
1979	4	5.0	|
1980	4	3.7	|
1981	3	4.7	|
1982	7	4.3	Ø3
1983	3	4.3	Ø4
1984	3	2.7	|
1985	2	2.3	|
1986	2	4.7	|
1987	10	8.3	|
1988	13	12.7	|
1989	15	11.0	Ø4
1990	5		

Robust Confidence Intervals for the Mean, based on the Jackknife:

Xavg =	3.96	(sample mean)
N =	28.00	(sample count)
q =	4.00	(groups of n measurements)
n =	7.00	(sub-sample count)
Ø1 =	4.52	(sub-sample mean 1)
Ø2 =	4.65	(sub-sample mean 2)
Ø3 =	3.59	(sub-sample mean 3)
Ø4 =	3.10	(sub-sample mean 4)
j1(Ø) =	2.29	(pseudovalue 1)
j2(Ø) =	1.90	(pseudovalue 2)
j3(Ø) =	5.10	(pseudovalue 3)
j4(Ø) =	6.57	(pseudovalue 4)
J(Ø) =	3.96	(Jackknife Mean)
$(j1-J)^2$ =	2.82	(standard deviation 1)
$(j2-J)^2$ =	4.24	(standard deviation 2)
$(j3-J)^2$ =	1.28	(standard deviation 3)
$(j4-J)^2$ =	6.80	(standard deviation 4)
t36,.90 =	1.31	(t value @ 90%)
t36,.95 =	1.70	(t value @ 95%)
t36,.975 =	2.05	(t value @ 97.5%)
t36,.99 =	2.47	(t value @ 99%)
CI @ 90% =	2.95	(± Confidence Interval @ 90%)
CI @ 95% =	3.82	(± Confidence Interval @95%)
CI @ 97.50% =	4.61	(± Confidence Interval @ 97.5%)
CI @ 99% =	5.55	(± Confidence Interval @ 99%)

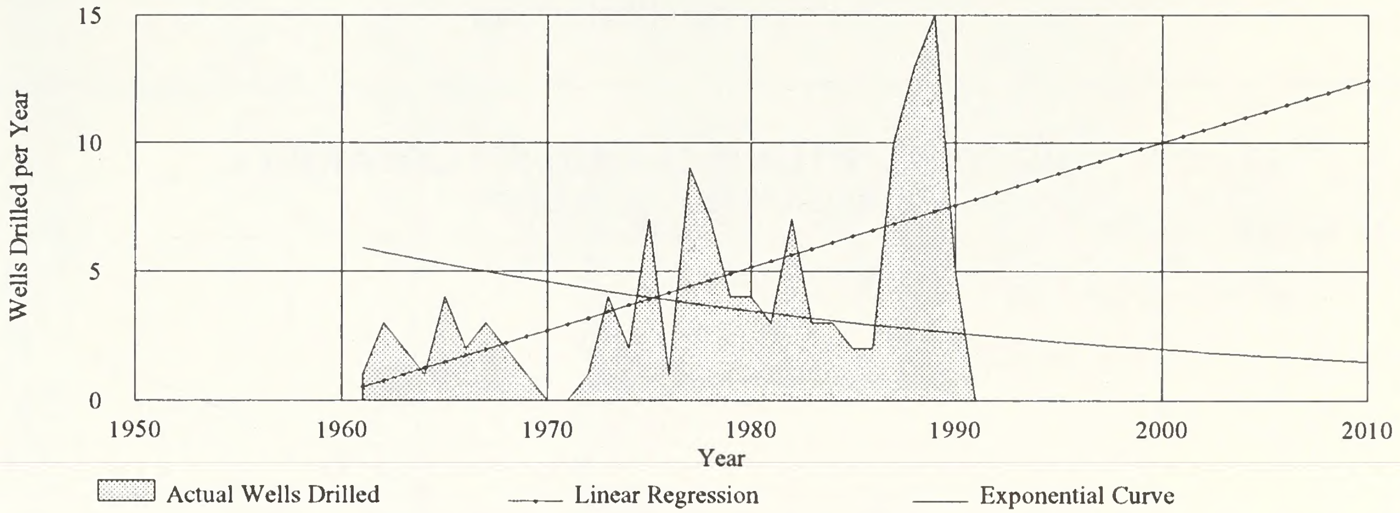
(Reference: "Numerical Geology", section 9e.2, pg. 110)

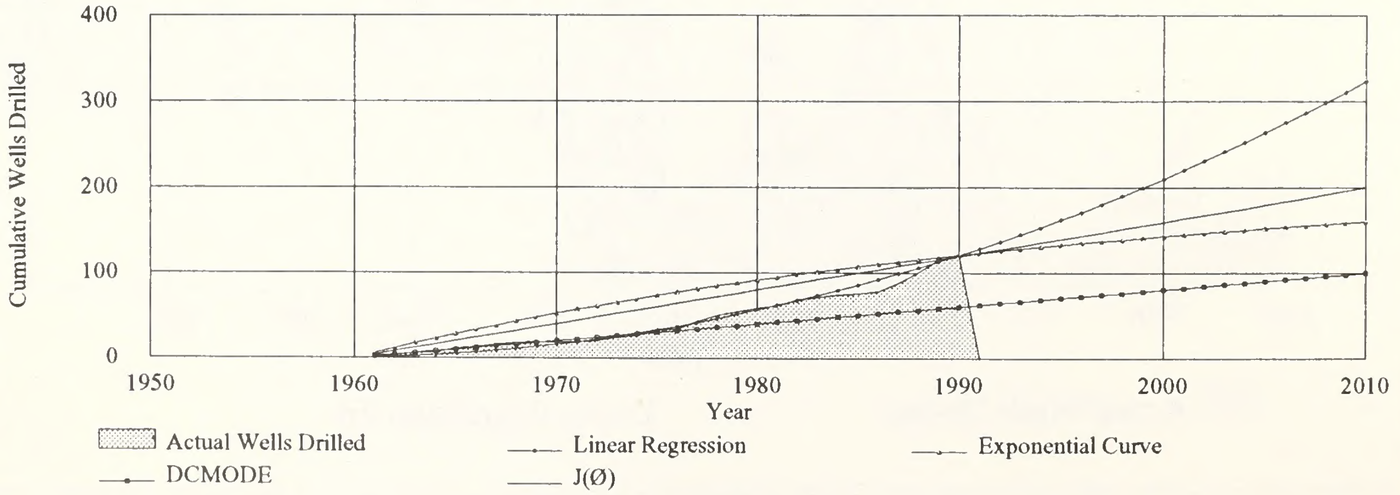

GREATER NITCHIE GULCH STUDY AREA
NUMBER OF WELLS DRILLED PER YEAR
FREQUENCY
25%
20%
15%
10%
5%
0%
2
5
6
5
4
1
0
3
0
1
1
2
0
1
2
3
4
5
6
7
8
9
10
1961 - 1990 (Wells/Year)


GREATER NITCHIE GULCH STUDY AREA
REGRESSION ANALYSIS
Wells Drilled per Year
15
10
5
0
1961
1966
1971
1976
1981
1986
1991
1996
2001
2006
Year
Actual Wells Drilled
Linear Regression Fit

GREATER NITCHIE GULCH STUDY AREA
NUMBER OF WELLS DRILLED PER YEAR
FUTURE PROJECTIONS
(Based on Wells Drilled between 1961 -1990)

Year	Linear Regression Y = 0.243159X - 476.327 Wells/yr	 Cumulative	Exponential Curve Y = EXP(-0.0280105X) x (4.21927 E24) Wells/yr	 Cumulative	DCMODE 2 wells/yr Cumulative	J(Ø) 4 wells/yr Cumulative
1990	8	2	3	3	2	4
1991	8	15	3	5	8	4
1992	8	23	2	2	8	12
1993	8	32	2	10	9	16
1994	9	41	2	12	10	20
1995	8	49	2	15	12	28
1999	9	58	2	17	14	28
1997	9	67	2	19	16	32
1997	10	77	2	21	18	36
1999	10	67	2	23	0	40
2000	10	67	2	25	22	44
2001	10	107	2	27	24	48
2002	10	117	2	29	28	52
2003	11	128	2	37	28	56
2008	11	139	2	32	30	80
2008	11	150	2	34	32	64
2006	11	162	2	36	34	68
2008	12	173	2	37	36	28
2008	12	185	2	39	38	28
2008	12	197	2	41	10	80
2010	12	210	1	12	42	84





APPENDIX 13

STATISTICAL ANALYSIS USED TO PROJECT DRILLING ACTIVITY IN WAMSUTTER ARCH

WAMSUTTER ARCH STUDY AREA
WELLS DRILLED PER YEAR
CONCLUSIONS
(Based on Wells Drilled between 1953 - 1990)

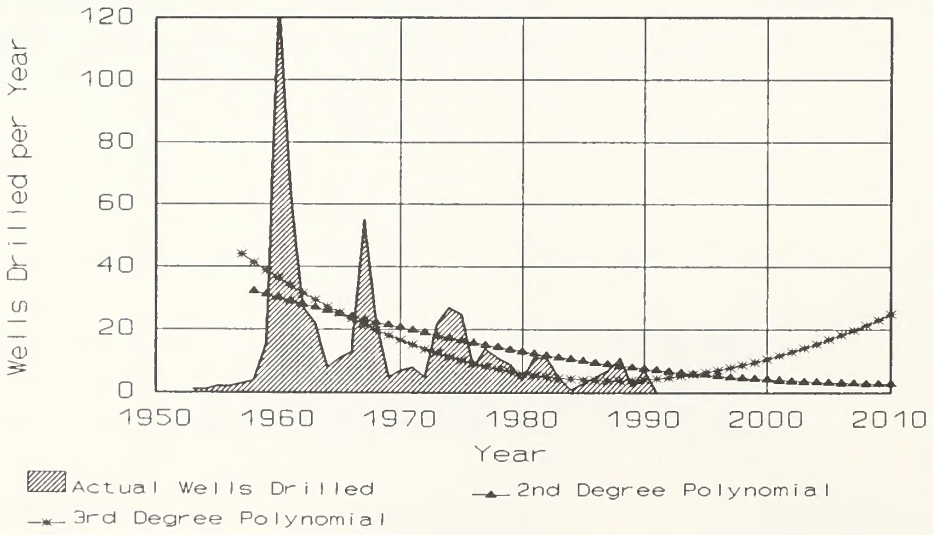
A Non-Normal distribution is obtained from a histogram of the wells drilled per year in the Green River Resource Area, from 1950 to 1989. Therefore, classical parametric statistics do not provide reasonable estimates for future projections. More robust techniques are used, which do not rely on assumptions of the data distribution.

The average number of wells drilled per year and the variability is described by the Dominate Cluster Mode (DCMODE) and Biweight Estimate (Sbi). The Jackknife Mean (J(ϕ)) and corresponding Confidence Interval (CI) provides a more robust measure than standard techniques which assume normal distribution. Still, this test is considered weaker than the DCMODE and Sbi, due to the large amount of variability in the data.

A 2nd degree polynomial curve provides the most probable future projection of 94 wells drilled over the next 20 years. This curve is within the DCMODE (4.67 wells/year) ± ½Sbi (4.78 wells/year). Note that the 90% CI is more variable than the Sbi.

A 3rd degree polynomial curve provides the maximum future projection of 253 wells drilled over the next 20 years. This curve is within the DCMODE (4.67 wells/year) ± 2Sbi (19.12 wells/year) and the 97.5% CI.

	Most Probable Projection 2nd Degree Polynomial $Y = 41{,}387.5 - 41.1435X + 0.0102259X^2$		Maximum Projection 3rd Degree Polynomial $Y = 745{,}597 - 1042.12X + 0.482409X^2 - 7.38728E{-}05X^3$	
Year	Well/yr	Cumulative	Wells/yr	Cumulative
1990	8	8	4	4
1990	4	15	4	9
1990	7	28	5	19
1993	8	28	5	19
1994	8	39	6	24
1995	8	39	6	38
1996	5	70	7	38
1997	8	70	4	99
1997	5	58	9	54
1997	3	58	10	99
2000	4	62	18	38
2001	8	66	12	38
2002	4	70	13	99
2003	7	94	14	164
2004	7	70	15	129
2005	7	70	12	145
2006	3	91	18	164
2007	8	70	23	183
2008	3	70	21	205
2009	3	91	23	228
2010	3	94	25	253



WAMSUTTER ARCH STUDY AREA
NUMBER OF WELLS DRILLED PER YEAR
1953 - 1990
SUMMARY STATISTICS & LINEAR REGRESSION

Data Count	Year	Actual Wells/yr	Regression Wells/yr	Cumulative Wells
1	1953	2	24.1	1
2	1954	1	23.7	2
3	1955	2	23.2	4
4	1956	2	22.7	6
5	1957	3	22.2	9
6	1958	4	21.8	13
7	1959	16	21.3	29
8	1960	125	20.8	154
9	1961	63	20.3	217
10	1962	27	19.9	244
11	1963	22	19.4	266
12	1964	8	18.9	274
13	1965	11	18.4	285
14	1966	13	18.0	298
15	1967	55	17.5	353
16	1968	23	17.0	376
17	1969	5	16.6	381
18	1970	2	16.1	388
19	1971	8	15.6	396
20	1972	5	15.1	401
21	1973	22	14.7	423
22	1974	27	14.2	450
23	1975	25	13.7	475
24	1976	8	13.2	483
25	1977	14	12.8	497
26	1978	11	12.3	508
27	1979	9	11.8	517
28	1980	4	11.3	521
29	1981	11	10.9	532
30	1982	11	10.4	543
31	1983	5	9.9	548
32	1984	1	9.4	549
33	1985	3	9.0	552
34	1986	5	8.5	557
35	1987	7	8.0	564
36	1988	11	7.6	575
37	1989	2	7.1	577
38	1990	2	6.6	584
39	1991		6.1	6.1
40	1992		5.7	11.8
41	1993		5.2	17.0
42	1994		4.7	21.7
43	1995		4.2	25.9
44	1996		3.8	29.7
45	1997		3.3	33.0
46	1998		2.8	35.8
47	1999		2.3	38.2
48	2000		1.9	40.0
49	2001		1.4	41.4
50	2002		0.9	42.3
51	2003		0.5	42.8
52	2004		-0.0	42.8
53	2005		-0.5	42.3
54	2006		-1.0	41.3
55	2007		-1.4	39.9
56	2008		-1.9	37.9
57	2009		-2.4	35.6
58	2010		-2.9	32.7

SUMMARY STATISTICS

Sbi =	9.56	(Biweight Estimate)
MAD =	8.00	(Median Deviation from the Median)
VAR =	500.92	(Sample Variance)
STD =	22.38	(Sample Standard Deviation)
MIN =	1.00	(Minimum)
MIDR =	63.00	(Mid Range)
MEDN =	11.00	(Median)
MODE =	5.25	(Mode)
DCMODE =	4.67	(Dominant Cluster Mode)
HARM =	4.56	(Harmonic Mean)
AVG =	15.37	(Arithmetic Mean)
MAX =	125.00	(Maximum)
COUNT =	38.00	(Sample Count)

Wells/yr	Count	%
0.0	0	0.0%
3.5	8	21.1%
7.0	9	23.7%
10.5	4	10.5%
14.0	7	18.4%
17.5	1	2.6%
21.0	0	0.0%
24.5	3	7.9%
28.0	3	7.9%
	3	7.9%

Regression Output:		
Constant		949.0211
Std Err of Y Est		22.36691
R Squared		0.053839
No. of Observations		38
Degrees of Freedom		36
X Coefficient(s)	-0.47357	
Std Err of Coef.	0.330881	

WAMSUTTER ARCH STUDY AREA
NUMBER OF WELLS DRILLED PER YEAR

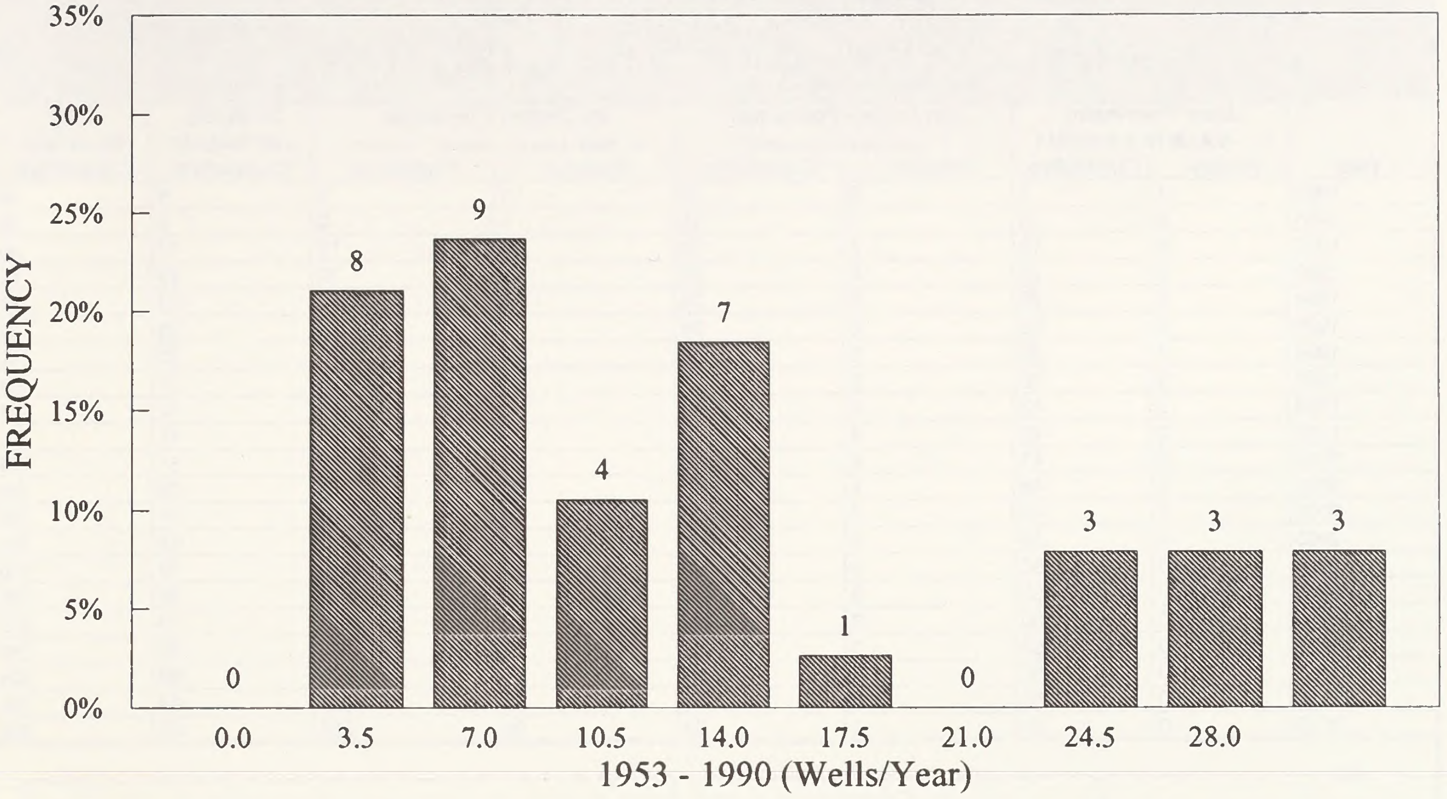
Year	Actual Wells/yr	3-Point Moving Average Smoothed Wells/yr	
1953	1		
1954	1	1.3	Ø1
1955	2	1.7	|
1956	2	2.3	|
1957	3	3.0	|
1958	4	7.7	|
1959	16	48.3	|
1960	125	68.0	|
1961	63	71.7	|
1962	27	37.3	Ø1
1963	22	19.0	Ø2
1964	8	13.7	|
1965	14	10.7	|
1966	13	26.3	|
1967	55	30.3	|
1968	23	27.7	|
1969	5	11.7	|
1970	7	6.7	|
1971	8	6.7	Ø2
1972	5	11.7	Ø3
1973	22	18.0	|
1974	27	24.7	|
1975	25	20.0	|
1976	8	15.7	|
1977	14	11.0	|
1978	14	11.3	|
1979	5	9.0	|
1980	1	8.0	Ø3
1981	14	8.7	Ø4
1982	11	9.0	|
1983	5	6.7	|
1984	1	3.0	|
1985	3	3.0	|
1986	5	5.0	|
1987	7	7.7	|
1988	11	6.7	|
1989	2	6.7	Ø4
1990	7		

Robust Confidence Intervals for the Mean, based on the Jackknife:

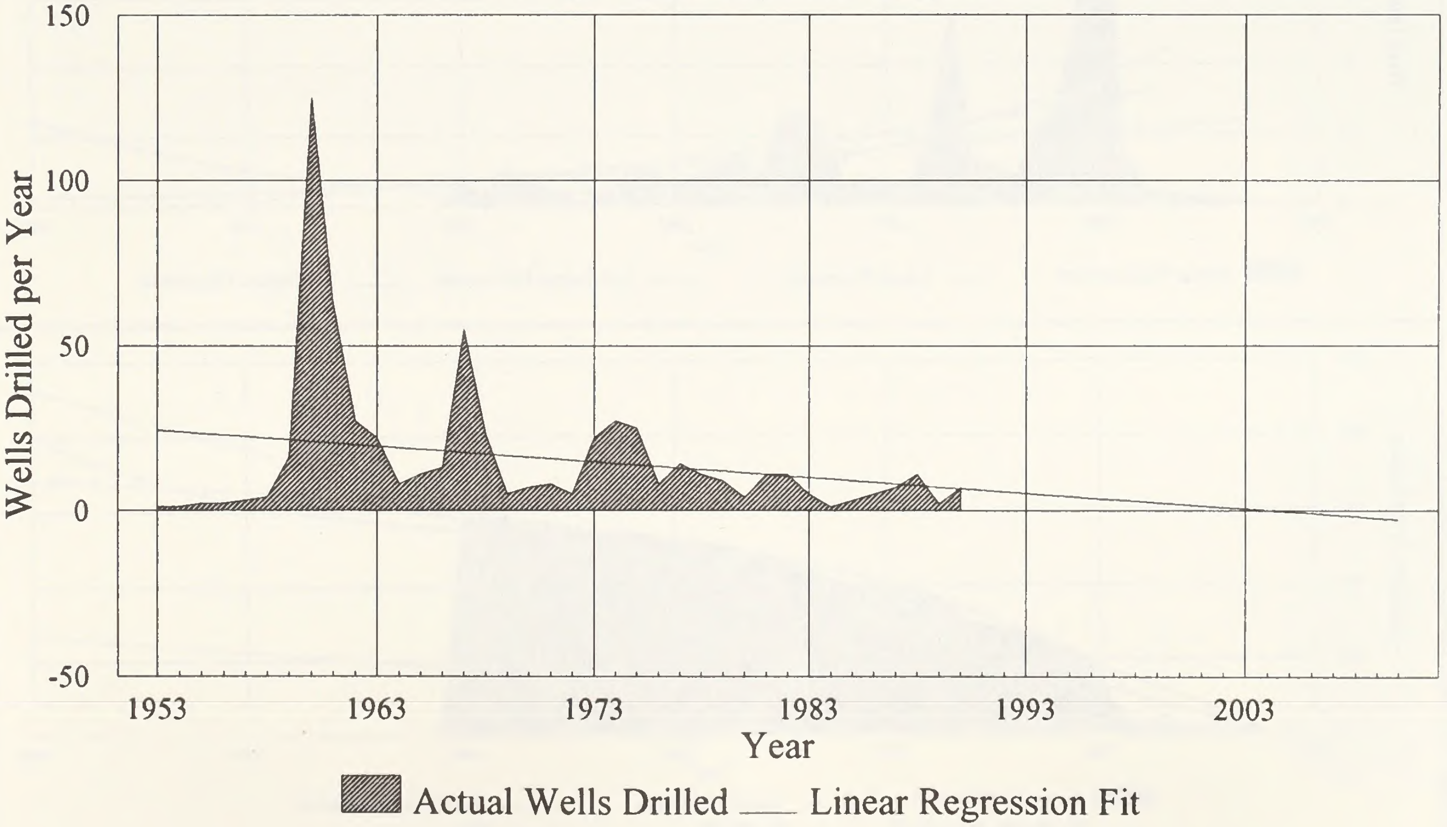
Xavg =	16.05	(sample mean)
N =	36.00	(sample count)
q =	4.00	(groups of n measurements)
n =	9.00	(sub-sample count)
Ø1 =	12.46	(sub-sample mean 1)
Ø2 =	15.74	(sub-sample mean 2)
Ø3 =	16.64	(sub-sample mean 3)
Ø4 =	19.35	(sub-sample mean 4)
j1(Ø) =	26.81	(pseudovalue 1)
j2(Ø) =	16.96	(pseudovalue 2)
j3(Ø) =	14.26	(pseudovalue 3)
j4(Ø) =	6.15	(pseudovalue 4)
J(Ø) =	16.05	(Jackknife Mean)
$(j1-J)^2$ =	115.96	(standard deviation 1)
$(j2-J)^2$ =	0.84	(standard deviation 2)
$(j3-J)^2$ =	3.19	(standard deviation 3)
$(j4-J)^2$ =	97.97	(standard deviation 4)
t36,.90 =	1.38	(t value @ 90%)
t36,.95 =	1.69	(t value @ 95%)
t36,.975 =	2.03	(t value @ 97.5%)
t36,.99 =	2.44	(t value @ 99%)
CI @ 90% =	11.77	(± Confidence Interval @ 90%)
CI @ 95% =	14.40	(± Confidence Interval @95%)
CI @ 97.50% =	17.30	(± Confidence Interval @ 97.5%)
CI @ 99% =	20.77	(± Confidence Interval @ 99%)

(Reference: "Numerical Geology", section 9e.2, pg. 110)

WAMSUTTER ARCH STUDY AREA
NUMBER OF WELLS DRILLED PER YEAR

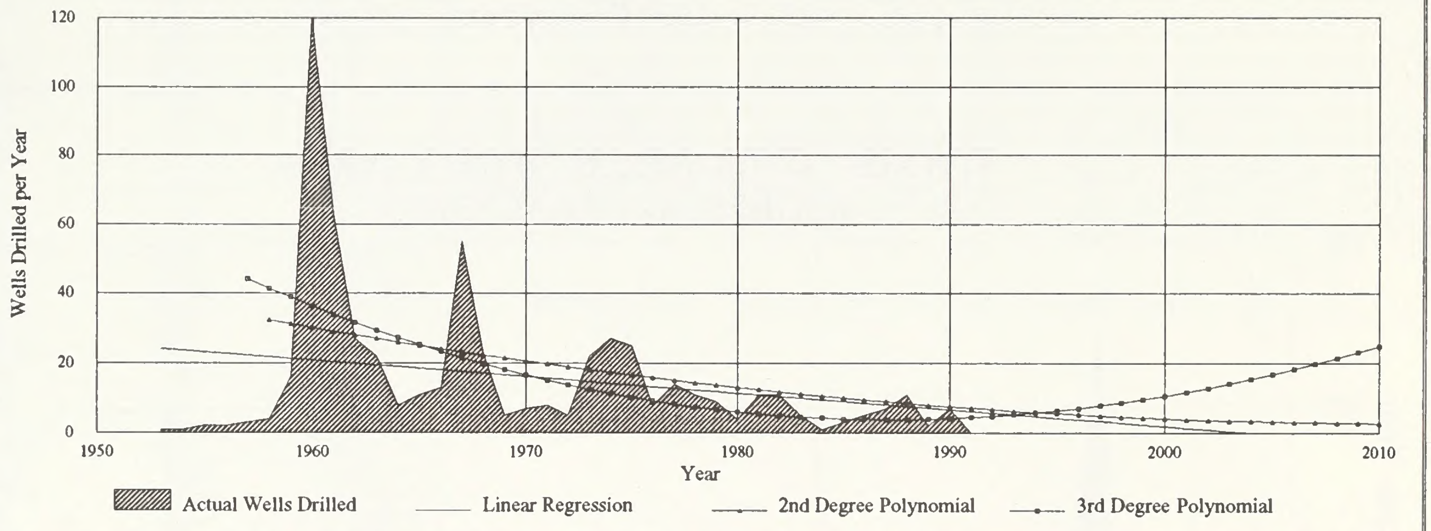


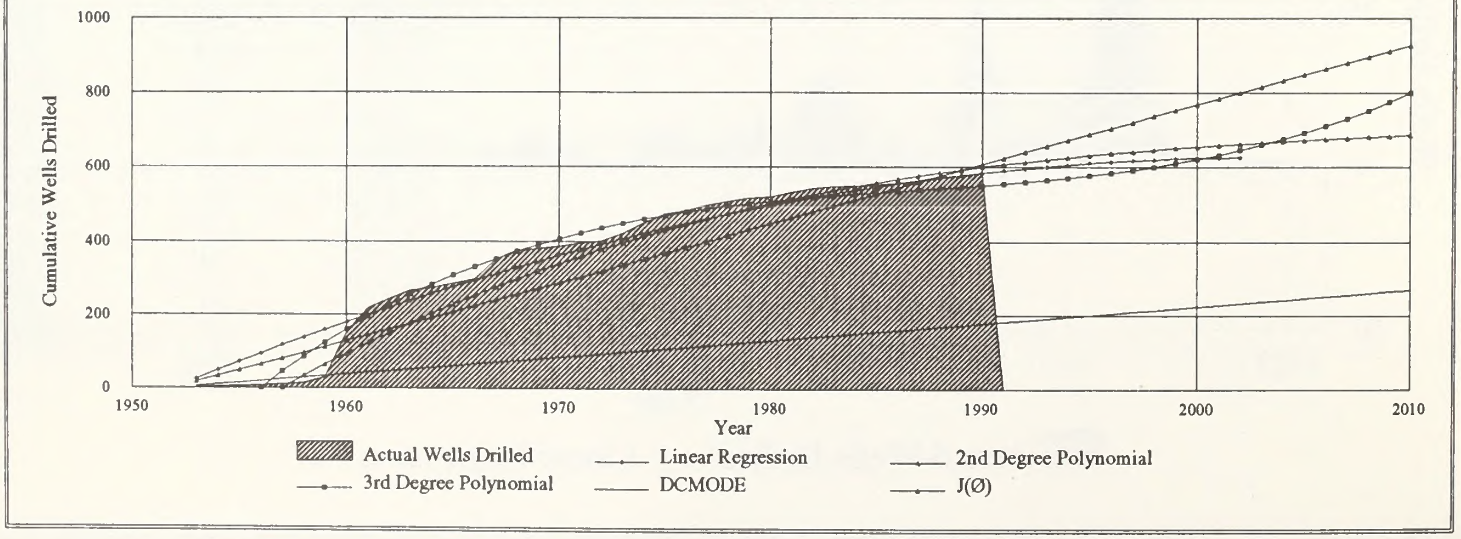
WAMSUTTER ARCH STUDY AREA
REGRESSION ANALYSIS



WAMSUTTER ARCH STUDY AREA
NUMBER OF WELLS DRILLED PER YEAR
FUTURE PROJECTIONS
(Based on Wells Drilled between 1953 -1990)

	Linear Regression $Y = -0.47357X + 949.0211$		2nd Degree Polynomial $Y = 41{,}387.5 - 41.1435X + 0.0102259X^2$		3rd Degree Polynomial $Y = 745{,}597 - 1042.12X + 0.482409X^2 - 7.38726\text{E-}5X^3$		DCMODE 4.67 wells/yr	J(Ø) 16 wells/yr
Year	Wells/yr	Cumulative	Wells/yr	Cumulative	Wells/yr	Cumulative	Cumulative	Cumulative
1990	7	7	8	8	4	4	5	16
1991	6	13	7	15	4	9	9	32
1992	6	18	7	21	5	13	14	48
1993	5	24	6	28	5	19	19	64
1994	5	28	6	33	6	24	23	80
1995	4	33	6	39	6	31	28	96
1996	4	36	5	44	7	38	33	112
1997	3	40	5	49	8	46	37	128
1998	3	43	5	54	9	54	42	144
1999	2	45	4	58	10	64	47	160
2000	2	47	4	62	11	75	51	176
2001	1	48	4	66	12	86	56	192
2002	1	49	4	70	13	99	61	208
2003	0	50	3	73	14	113	65	224
2004	0	50	3	77	15	129	70	240
2005	0	50	3	80	17	145	75	256
2006	0	50	3	83	18	164	79	272
2007	0	50	3	86	20	183	84	288
2008	0	50	3	88	21	205	89	304
2009	0	50	3	91	23	228	89	320
2010	0	50	3	94	25	253	98	336





APPENDIX 13

SUCCESS RATIOS

GRRA RMP SUCCESS RATIOS
REPORT S62 - SUCCESS RATIOS BY DEPTH AND CLASS
DRILLING ANALYSIS DATA (DAAS) (R)

NUMBER OF WELLS = 1488
NUMBER OF PAGES = 1
TOTAL COST = $114.28
RUN DATE 04/17/90

****RETRIEVAL CRITERIA****

REPORT COMPL DATE....GE 5001
REPORT COMPL DATE....LE 9001

*** TOWNSHIPS AND RANGES**

STATE................EQ 49	STATE................EQ 49	STATE................EQ 49	STATE................EQ 49	STATE................EQ 49
TOWNSHIP.............GE 12N	TOWNSHIP.............GE 16N	TOWNSHIP.............GE 19N	TOWNSHIP.............GE 24N	TOWNSHIP.............GE 29N
TOWNSHIP.............LE 15N	TOWNSHIP.............LE 18N	TOWNSHIP.............LE 23N	TOWNSHIP.............LE 28N	TOWNSHIP.............LE 30N
RANGE................GE 96W	RANGE................GE 95W	RANGE................GE 97W	RANGE................GE 97W	RANGE................GE 100W
RANGE................LE 114W	RANGE................LE 108W	RANGE................LE 111W	RANGE................LE 112W	RANGE................LE 108W

END OF CRITERIA

DEPTH RANGE	NEW FIELD WILDCATS				OTHER EXPLORATORY				DEVELOPMENT				SUMMARY			
	OIL	GAS	TOTAL	SUCCESS RATIO	OIL	GAS	TOTAL	SUCCESS RATIO	OIL	GAS	TOTAL	SUCCESS RATIO	OIL	GAS	TOTAL	SUCCESS RATIO
1	0	0	1	0	0	0	1	0	0	0	3	0	0	0	10	0
2	0	1	9	0.11	0	0	9	0	0	1	5	0.2	0	2	14	0.14
3	0	1	19	0.05	0	0	2	0	17	8	53	0.47	17	10	75	0.36
4	0	5	37	0.14	0	1	9	0.11	18	30	86	0.56	18	37	134	0.41
5	0	8	60	0.13	1	7	15	0.53	95	81	228	0.77	100	97	313	0.63
6	2	11	59	0.22	1	12	22	0.59	8	238	295	0.83	11	263	381	0.72
7	5	25	69	0.43	3	22	33	0.76	15	145	178	0.9	23	194	283	0.77
8	3	27	67	0.45	4	11	25	0.6	15	35	64	0.78	22	74	158	0.41
9	2	8	30	0.33	4	8	14	0.86	6	22	33	0.85	12	39	78	0.65
10	1	3	15	0.27	0	6	7	0.86	0	10	10	1	1	19	33	0.61
11	0	2	3	0.5	0	1	3	0.33	0	1	1	1	0	5	9	0.56
TOTALS	**13**	**91**	**375**	**0.28**	**13**	**68**	**131**	**0.62**	**174**	**571**	**956**	**0.78**	**204**	**740**	**1488**	**0.63**

DEPTH	1 = 0-1249	3 = 2500-3749	5 = 5000-7499	7 = 10,000-12,499	9 = 15,000-17,499	11 = 20,000
RANGES	2 = 1250-2499	4 = 3750-4999	6 = 7500-9999	8 = 12,500-14,999	10 = 17,500-19,999	& DEEPER

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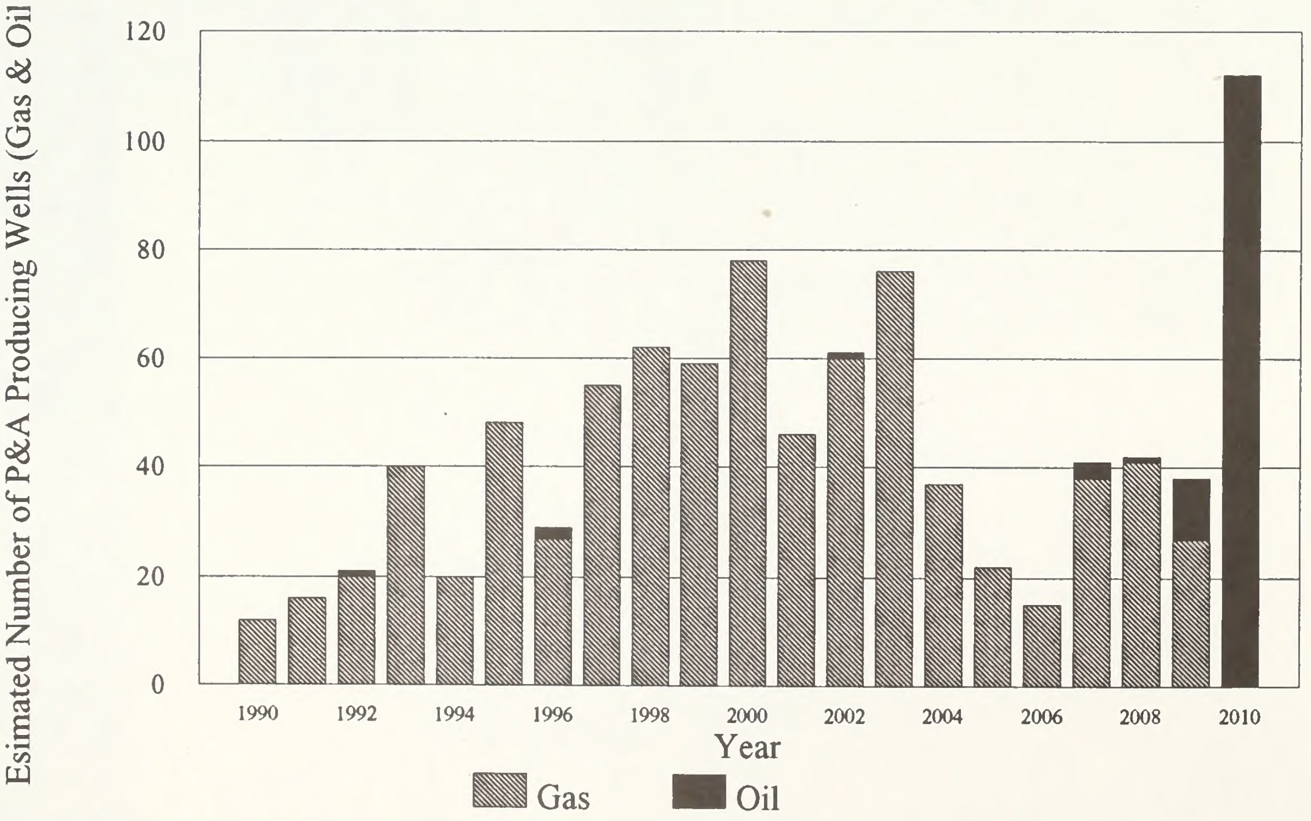
APPENDIX 13

PROJECTED PRODUCING WELL ABANDONMENTS

GREEN RIVER RESOURCE AREA
PROJECTED PRODUCING WELL ABANDONMENTS
(Based on Wells Completed between 1900 -1990)

Year	Total Abandoned Producers	Abandoned Gas Producers	Abandoned Oil Producers
Dec-90	78	12	0
Dec-9[illegible]	16	46	0
Dec-92	21	27	1
Dec-93	40	40	0
Dec-94	20	27	0
Dec-95	48	78	0
Dec-96	20	27	[illegible]
Dec-97	55	55	0
Dec-96	62	62	0
Dec-96	59	55	0
Dec-2000	78	78	0
Dec-2001	46	46	0
Dec-2002	61	55	[illegible]
Dec-2003	76	78	0
Dec-2004	37	37	0
Dec-200[illegible]	22	22	0
Dec-2006	15	15	0
Dec-2007	41	38	[illegible]
Dec-2009	4[illegible]	48	[illegible]
Dec-2009	38	27	11
Dec-2010	112	0	112
TOTAL	930	799	131



Source: PI Historical Well Data

APPENDIX 13

COALBED METHANE WELL ECONOMIC ANALYSIS

GREEN RIVER RESOURCE AREA
COALBED METHANE POTENTIAL ASSESSMENT

The following discussion outlines the specific assumptions and calculations used to calculate the minimum initial production rate required to economically produce a coalbed methane well with and without the current coalbed methane tax credit.

Calculation of original-gas-in-place (OGIP):

OGIP = (Area)*(Thickness)*(Gas Content)*(Density)

Area = 320 acres
Thickness = 30 feet
Gas Content = 175 SCF/ton
Density = 1800 tons/acre-foot

OGIP = 3024000 MCF

Calculation of recoverable OGIP:

Recoverable OGIP = (Recovery Factor)*(OGIP)

Recovery Factor = 0.65
OGIP = 3024000 MCF

Recoverable OGIP = 1965600 MCF

Calculation of capital costs (CC):

CC = (Drilling Costs + Completion Costs + Facility Costs)

Note: Facility costs include production equipment and water disposal and gas gathering systems.

Drilling Costs = $400,000
Completion Costs = $100,000
Facility Costs = $200,000

CC = $700,000

Operating costs of $1000/month and water disposal cots of $0.20/bbl were assumed. A current market gas price of $1.00/MCF and the tax credit of $0.87/MCF were used. The tax credit was added to the gas price in the tax credit economic analysis. AN initial water production rate of 250 BWPD which declines during the producing life of the well was also assumed. A discount rate of 8.75 percent was used. A discount payout of less than eight years was required to consider the well as economic.

An initial production rate of 225 MCFPD is required to produce a coalbed methane well without application of the tax credit. An initial production rate of only 113 MCFPD is required to produce a coalbed methane well with application of the tax credit. Due to the nature of coalbed methane production, the economic analyses assumed that the true production rate would be 33 percent of the initial production rate; however, this true production rate would increase over an 18 month period to 133 percent of the initial production rate. Attachments Nos. 1 and 2 are the economic analyses for the coalbed methane well example.

Attachment No. 1 - Economic Analysis Without Tax Credit
Attachment No. 2 - Economic Analysis With Tax Credit

SINGLE COALBED METHANE WELL **FEDERAL LEASE, 12.5% ROYALTY RATE** **PAYING WELL DETERMINATION** **FORT UNION FORMATION**	**Attachment No. 1**	DATE : 02/11/92 TIME : 08:14:45 DBS FILE : RESMAN SETUP FILE : FLAT SEQ NUMBER : 20

ITEM	INPUT DATA							CALCULATED DATA				
	SCHEDULING RATES			SCHEDULE UNTIL		PROCEDURE		ULTIMATE	LAST	EFF. DECL	INIT. RATE	FINAL RATE
401 START	01/91											
406 GAS	225.00	900.00	M/D	1.50	YRS	EXP X		266.583	6/92	-151.98	6,844.000	27,375.000
411 "	X	25.00	M/D	20.00	YRS	EXP X		1,915.364	12/10	17.61	27,375.000	760.000
416 WTR	250.00	25.00	B/D	20.00	YRS	EXP X		713.329	12/10	10.87	7,604.000	760.000
421 PRI/GAS	1.00	1.00	$/M	TO	LIFE	PC	0.00		12/90		1.000	1.000
426 PRI/WTR	0.20	0.20	$/B	TO	LIFE	PC	0.00		12/90		0.200	0.200
431 OPC/T	1,000.00	1,000.00	$/M	TO	LIFE	PC	0.00		12/90		1,000.000	1,000.000
436 STX/OIL	6.00	D	%	TO	LIFE	FLAT	0.00		12/10		0.060	0.060
446 STX/GAS	6.00	D	%	TO	LIFE	FLAT	0.00		12/10		0.060	0.060
458 ATX	7.20	7.20	%	TO	LIFE	FLAT	0.00		12/10		0.072	0.072
460 NET/WI	100.00	D	%	TO	LIFE	FLAT	0.00		12/10		1.000	1.000
470 NET/NIC	87.50	D	%	TO	LIFE	FLAT	0.00		12/10		0.875	0.875
480 NET/NIG	87.50	D	%	TO	LIFE	FLAT	0.00		12/10		0.875	0.875

INVESTMENT	TANGIBLES & INTANGIBLES		TIME	PROCEDURE			TOTAL T&I	MONTH	RISK INV.	TOT. T&I&R	ESC. T&I&R
801 COMPL	700.00	0.00 M$G	01/91	AD	PC	0.00	700.000	1/91	.	700.000	700.000

RESERVE PARAMETERS		ITEM			ITEM	
203 CUMO, MB	0.00	CUMG,	MMF	0.00	CUML,	MB
206 WELLS	0.00	1.00				

PROJECT ASSUMPTIONS

BASE DATE : 1/91	P.W. DATE : 1/91	REPORT DATE : 1/91	
QUALIFIERS -	PROD :	OWNER :	OTHER :

SINGLE COALBED METHANE WELL
FEDERAL LEASE, 12.5% ROYALTY RATE
PAYING WELL DETERMINATION
FORT UNION FORMATION

RESERVES AND ECONOMICS

AS OF DATE: 1/91
Attachment No. 1a

DATE : 11/92
TIME : :14:45
DBS FILE : RESMAN
SETUP FILE : FLAT
SEQ NUMBER : 20

-END- MO-YR	GROSS OIL PRODUCTION MBBLS	GROSS GAS PRODUCTION MMCF	NET OIL PRODUCTION MBBLS	NET GAS PRODUCTION MMCF	NET OIL PRICE $/BBL	NET GAS PRICE $/MCF	NET OIL SALES M$	NET GAS SALES M$	TOTAL NET SALES M$
12-91	0.000	135.055	0.000	118.173	0.000	1.000	0.000	118.173	118.173
12-92	0.000	288.075	0.000	252.066	0.000	1.000	0.000	252.066	252.066
12-93	0.000	271.080	0.000	237.195	0.000	1.000	0.000	237.195	237.195
12-94	0.000	223.348	0.000	195.430	0.000	1.000	0.000	195.430	195.430
12-95	0.000	184.021	0.000	161.019	0.000	1.000	0.000	161.019	161.019
12-96	0.000	151.619	0.000	132.666	0.000	1.000	0.000	132.666	132.666
12-97	0.000	124.922	0.000	109.307	0.000	1.000	0.000	109.307	109.307
S TOT	0.000	1378.120	0.000	1205.854	0.000	1.000	0.000	1205.854	1205.854
AFTER	0.000	537.407	0.000	470.231	0.000	1.000	0.000	470.231	470.231
TOTAL	0.000	1915.527	0.000	1676.086	0.000	1.000	0.000	1676.086	1676.086

-END- MO-YR	WINDFALL PROFIT TAX M$	NET ADVAL & PROD. TAXES M$	DIRECT OPER EXPENSE M$	INTEREST PAID M$	CAPITAL REPAYMENT M$	EQUITY INVESTMENT M$	FUTURE NET CASHFLOW M$	CUMULATIVE CASHFLOW M$	CUM. DISC. CASHFLOW M$
12-91	0.000	15.088	29.239	0.000	0.000	700.000	-626.154	-626.154	-629.805
12-92	0.000	32.184	27.364	0.000	0.000	0.000	192.518	-433.636	-460.470
12-93	0.000	30.285	25.693	0.000	0.000	0.000	181.217	-252.420	-313.275
12-94	0.000	24.952	24.204	0.000	0.000	0.000	146.273	-106.147	-204.021
12-95	0.000	20.559	22.877	0.000	0.000	0.000	117.583	11.436	-123.260
12-96	0.000	16.939	21.694	0.000	0.000	0.000	94.033	105.469	-63.868
12-97	0.000	13.956	20.640	0.000	0.000	0.000	74.710	180.180	-20.475
S TOT	0.000	153.964	171.712	0.000	0.000	700.000	180.180	180.180	-20.475
AFTER	0.000	60.039	210.958	0.000	0.000	0.000	199.234	379.413	74.044
TOTAL	0.000	214.003	382.670	0.000	0.000	700.000	379.413	379.413	74.044

	OIL	GAS			P.W. %	P.W., M$
GROSS WELLS	0.000	1.000	LIFE, YRS.	20.000	5.000	184.486
GROSS ULT., MB & MMF	0.000	1,915.527	DISCOUNT %	8.750	10.000	42.411
GROSS CUM., MB & MMF	0.000	0.000	UNDISCOUNTED PAYOUT, YRS.	4.900	15.000	-64.029
GROSS RES., MB & MMF	0.000	1,915.527	DISCOUNTED PAYOUT, YRS.	7.650	20.000	-145.877
NET RES., MB & MMF	0.000	1,676.086	UNDISCOUNTED NET/INVEST.	1.540	25.000	-210.305
NET REVENUE, M$	0.000	1,676.086	DISCOUNTED NET/INVEST.	1.110	30.000	-262.079
INITIAL PRICE, $	0.000	1.000	RATE-OF-RETURN, PCT.	11.990	40.000	-339.639
INITIAL N.I., PCT.	0.000	87.500	INITIAL W.I., PCT.	100.000	60.000	-435.283
					80.000	-491.209
					100.000	-527.542

SINGLE COALBED METHANE WELL
FEDERAL LEASE, 12.5% ROYALTY RATE
PAYING WELL DETERMINATION
FORT UNION FORMATION

Attachment No. 2

DATE : 02/11/92
TIME : 08:17:46
DBS FILE : RESMAN
SETUP FILE : FLAT
SEQ NUMBER : 20

	INPUT DATA							CALCULATED DATA				
ITEM	SCHEDULING RATES			SCHEDULE UNTIL		PROCEDURE		ULTIMATE	LAST	EFF. DECL	INIT. RATE	FINAL RATE
401 START	01/91											
406 GAS	113.00	452.00	M/D	1.50	YRS	EXP	X	133.884	6/92	-151.98	3,437.000	13,748.000
411 "	X	25.00	M/D	20.00	YRS	EXP	X	1,129.915	12/10	14.48	13,748.000	760.000
416 WTR	250.00	25.00	B/D	20.00	YRS	EXP	X	713.329	12/10	10.87	7,604.000	760.000
421 PRI/GAS	1.87	1.87	$/M	TO	LIFE	PC	0.00		12/90		1.870	1.870
426 PRI/WTR	0.20	0.20	$/B	TO	LIFE	PC	0.00		12/90		0.200	0.200
431 OPC/T	1,000.00	1,000.00	$/M	TO	LIFE	PC	0.00		12/90		1,000.000	1,000.000
436 STX/OIL	6.00	D	%	TO	LIFE	FLAT	0.00		12/10		0.060	0.060
446 STX/GAS	6.00	D	%	TO	LIFE	FLAT	0.00		12/10		0.060	0.060
458 ATX	7.20	7.20	%	TO	LIFE	FLAT	0.00		12/10		0.072	0.072
460 NET/WI	100.00	D	%	TO	LIFE	FLAT	0.00		12/10		1.000	1.000
470 NET/NIC	87.50	D	%	TO	LIFE	FLAT	0.00		12/10		0.875	0.875
480 NET/NIG	87.50	D	%	TO	LIFE	FLAT	0.00		12/10		0.875	0.875

INVESTMENT	TANGIBLES & INTANGIBLES			TIME	PROCEDURE			TOTAL T&I	MONTH	RISK INV.	TOT. T&I&R	ESC. T&I&R
801 COMPL	700.00	0.00	M$G	01/91	AD	PC	0.00	700.000	1/91	.	700.000	700.000

RESERVE PARAMETERS		ITEM			ITEM	
203 CUMO, MB	0.00	CUMG,	MMF	0.00	CUML,	MB
206 WELLS	0.00		1.00			

PROJECT ASSUMPTIONS

BASE DATE :	1/91	P.W. DATE :	1/91	REPORT DATE :	1/91	
QUALIFIERS -		PROD :		OWNER :		OTHER :

SINGLE COALBED METHANE WELL
FEDERAL LEASE, 12.5% ROYALTY RATE
PAYING WELL DETERMINATION
FORT UNION FORMATION

RESERVES AND ECONOMICS

AS OF DATE: 1/91
Attachment No. 2a

DATE : 11/92
TIME : 17:46
DBS FILE : RESMAN
SETUP FILE : FLAT
SEQ NUMBER : 20

-END- MO-YR	GROSS OIL PRODUCTION MBBLS	GROSS GAS PRODUCTION MMCF	NET OIL PRODUCTION MBBLS	NET GAS PRODUCTION MMCF	NET OIL PRICE $/BBL	NET GAS PRICE $/MCF	NET OIL SALES M$	NET GAS SALES M$	TOTAL NET SALES M$
12-91	0.000	67.827	0.000	59.349	0.000	1.870	0.000	110.983	110.983
12-92	0.000	145.402	0.000	127.227	0.000	1.870	0.000	237.915	237.915
12-93	0.000	141.231	0.000	123.577	0.000	1.870	0.000	231.089	231.089
12-94	0.000	120.777	0.000	105.680	0.000	1.870	0.000	197.622	197.622
12-95	0.000	103.286	0.000	90.375	0.000	1.870	0.000	169.002	169.002
12-96	0.000	88.328	0.000	77.287	0.000	1.870	0.000	144.527	144.527
12-97	0.000	75.536	0.000	66.094	0.000	1.870	0.000	123.596	123.596
S TOT	0.000	742.388	0.000	649.590	0.000	1.870	0.000	1214.733	1214.733
AFTER	0.000	387.684	0.000	339.223	0.000	1.870	0.000	634.348	634.348
TOTAL	0.000	1130.072	0.000	988.813	0.000	1.870	0.000	1849.080	1849.080

-END- MO-YR	WINDFALL PROFIT TAX M$	NET ADVAL & PROD. TAXES M$	DIRECT OPER EXPENSE M$	INTEREST PAID M$	CAPITAL REPAYMENT M$	EQUITY INVESTMENT M$	FUTURE NET CASHFLOW M$	CUMULATIVE CASHFLOW M$	CUM. DISC. CASHFLOW M$
12-91	0.000	14.170	29.239	0.000	0.000	700.000	-632.426	-632.426	-635.783
12-92	0.000	30.377	27.364	0.000	0.000	0.000	180.174	-452.253	-477.333
12-93	0.000	29.505	25.693	0.000	0.000	0.000	175.890	-276.363	-334.507
12-94	0.000	25.232	24.204	0.000	0.000	0.000	148.185	-128.177	-223.858
12-95	0.000	21.578	22.877	0.000	0.000	0.000	124.547	-3.631	-138.340
12-96	0.000	18.453	21.694	0.000	0.000	0.000	104.379	100.749	-72.435
12-97	0.000	15.781	20.640	0.000	0.000	0.000	87.175	187.924	-21.821
S TOT	0.000	155.097	171.712	0.000	0.000	700.000	187.924	187.924	-21.821
AFTER	0.000	80.994	210.958	0.000	0.000	0.000	342.396	530.320	124.576
TOTAL	0.000	236.091	382.670	0.000	0.000	700.000	530.320	530.320	124.576

	OIL	GAS			P.W. %	P.W., M$
GROSS WELLS	0.000	1.000	LIFE, YRS.	20.000	5.000	264.832
GROSS ULT., MB & MMF	0.000	1,130.072	DISCOUNT %	8.750	10.000	85.654
GROSS CUM., MB & MMF	0.000	0.000	UNDISCOUNTED PAYOUT, YRS.	5.030	15.000	-41.461
GROSS RES., MB & MMF	0.000	1,130.072	DISCOUNTED PAYOUT, YRS.	7.560	20.000	-135.398
NET RES., MB & MMF	0.000	988.814	UNDISCOUNTED NET/INVEST.	1.760	25.000	-207.174
NET REVENUE, M$	0.000	1,849.080	DISCOUNTED NET/INVEST.	1.180	30.000	-263.547
INITIAL PRICE, $	0.000	1.870	RATE-OF-RETURN, PCT.	13.370	40.000	-345.950
INITIAL N.I., PCT.	0.000	87.500	INITIAL W.I., PCT.	100.000	60.000	-444.420
					80.000	-500.491
					100.000	-536.346

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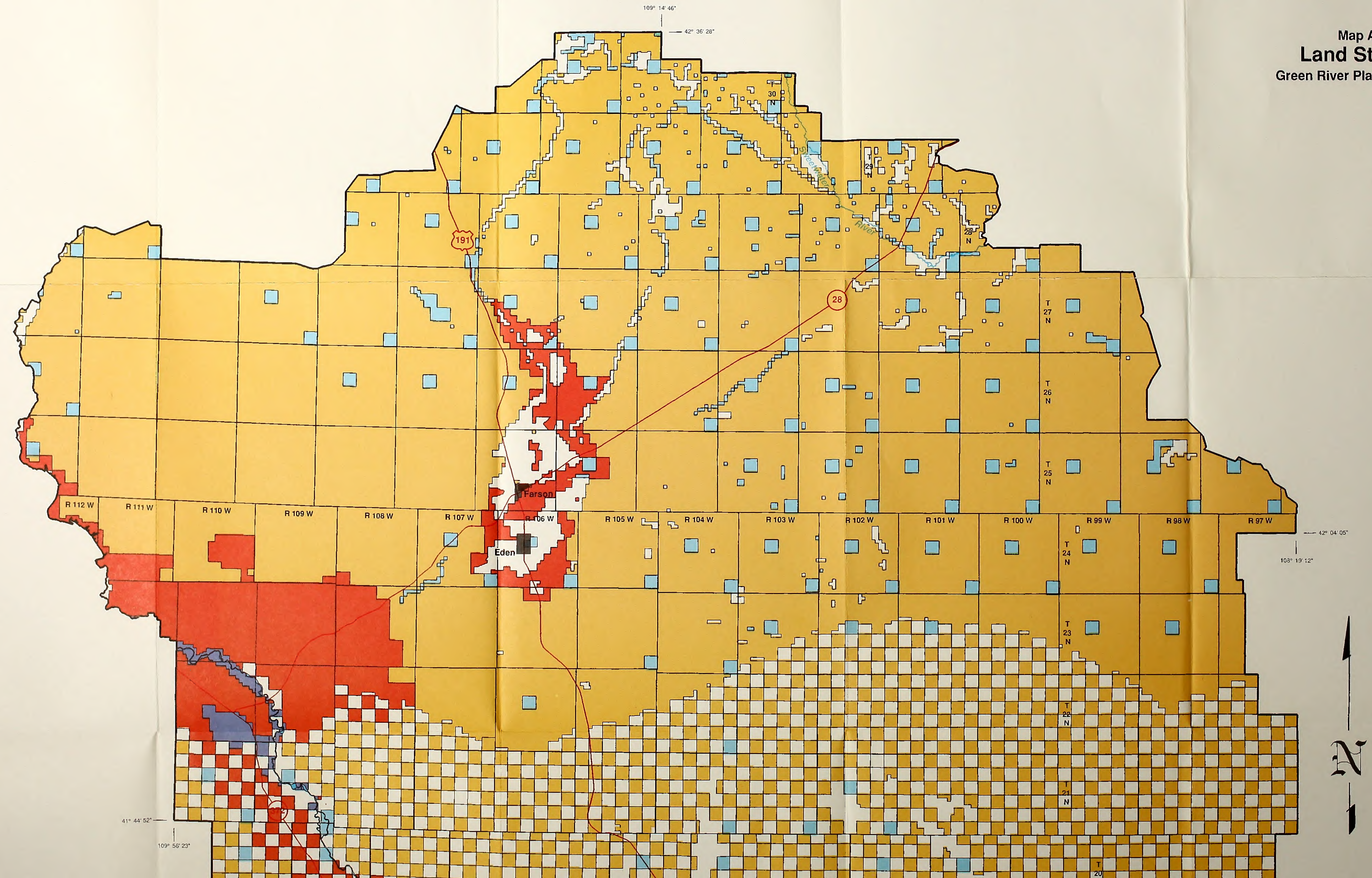
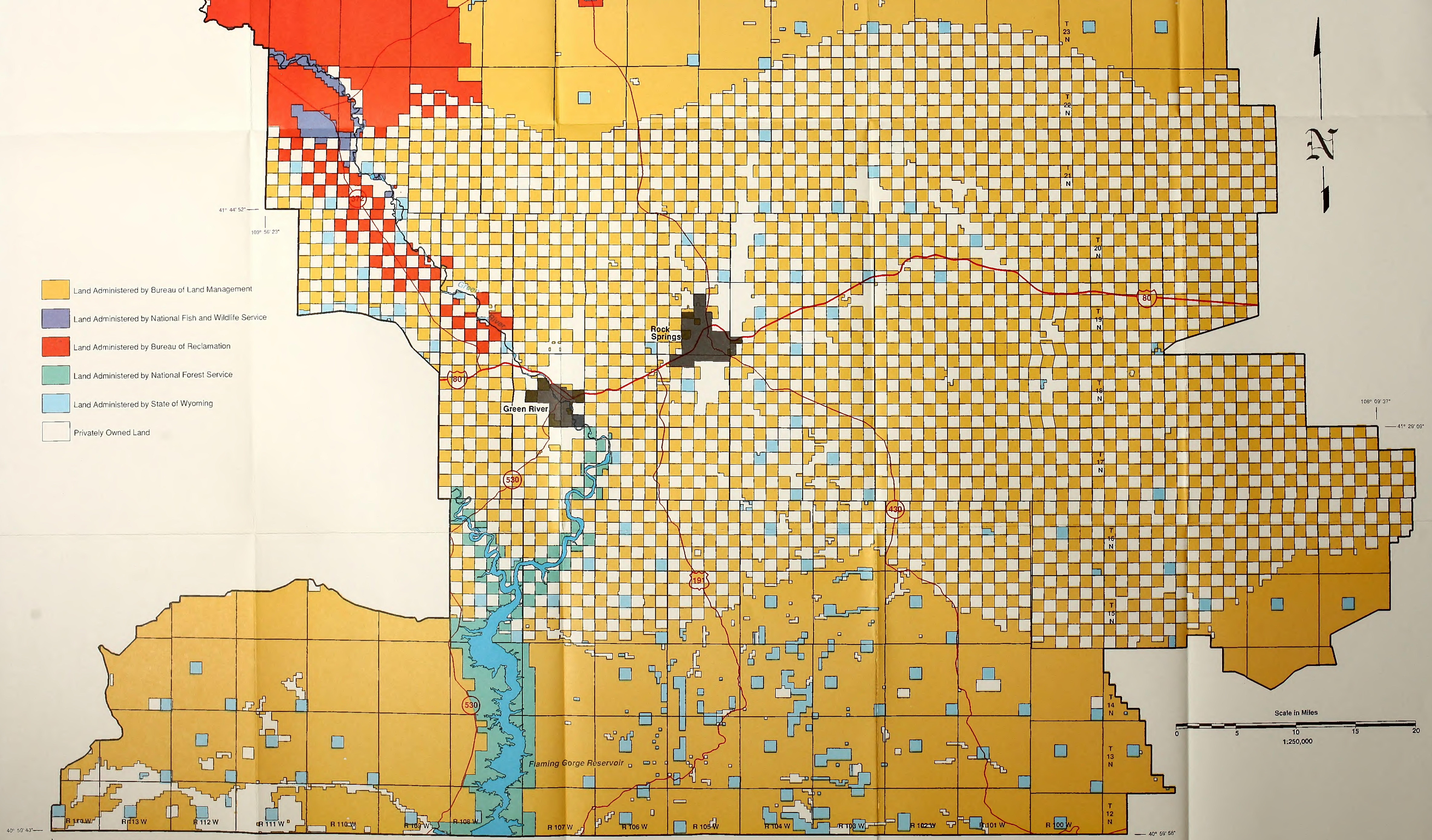
Map A

Land Status

Green River Planning Area





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Bureau of Land Management
Rock Springs, Wyoming

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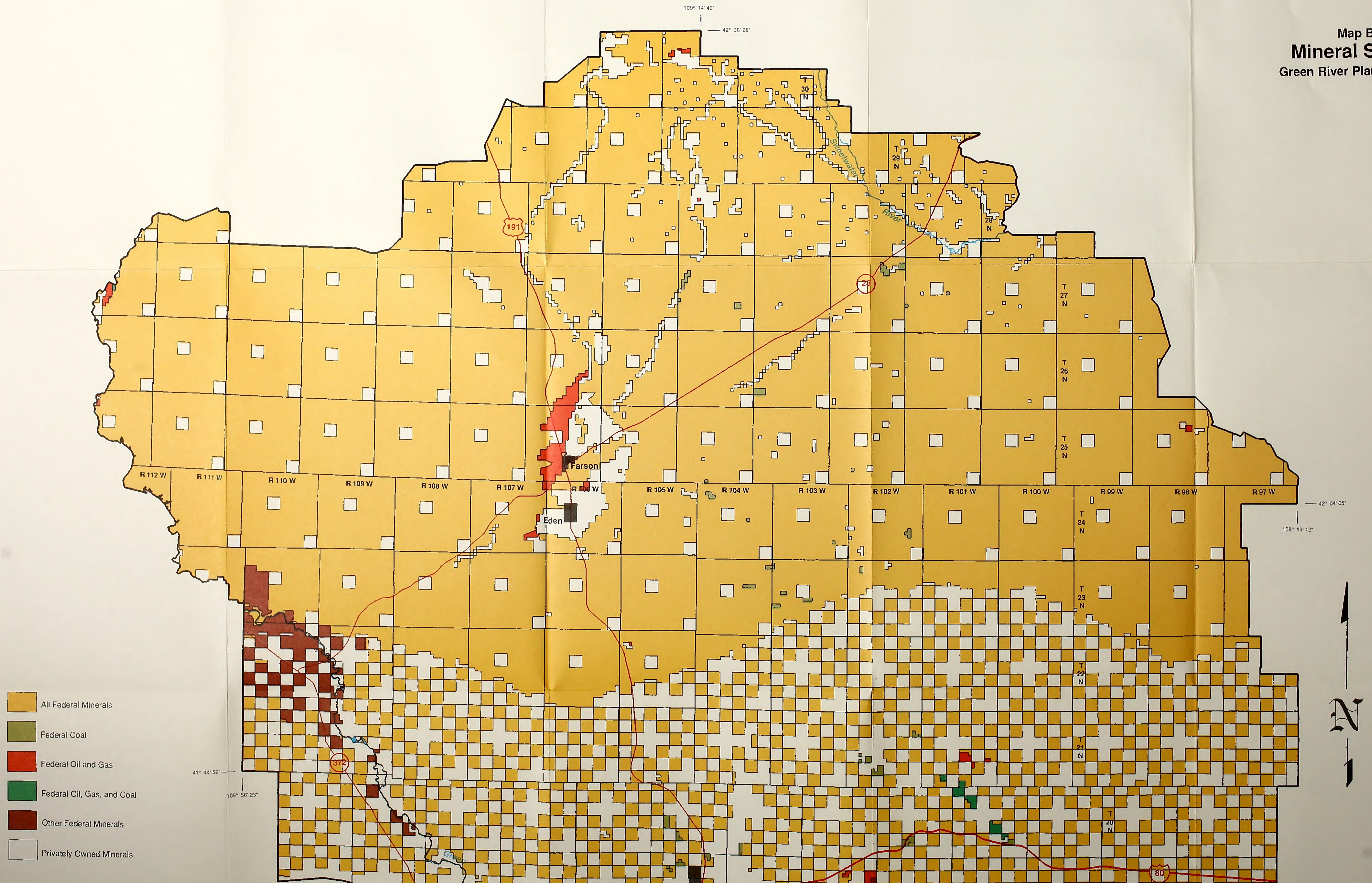
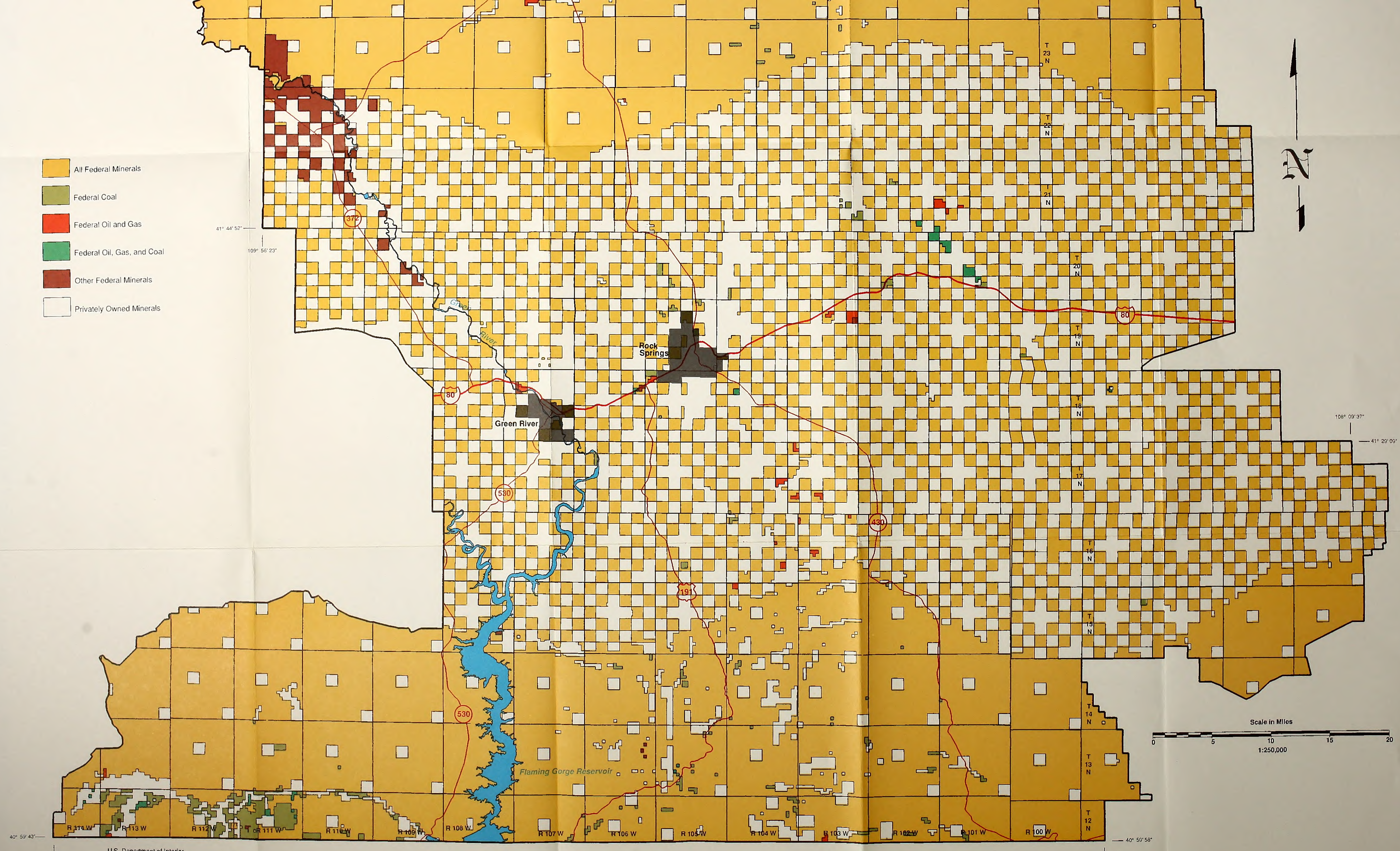
Map B
Mineral Status
Green River Planning Area





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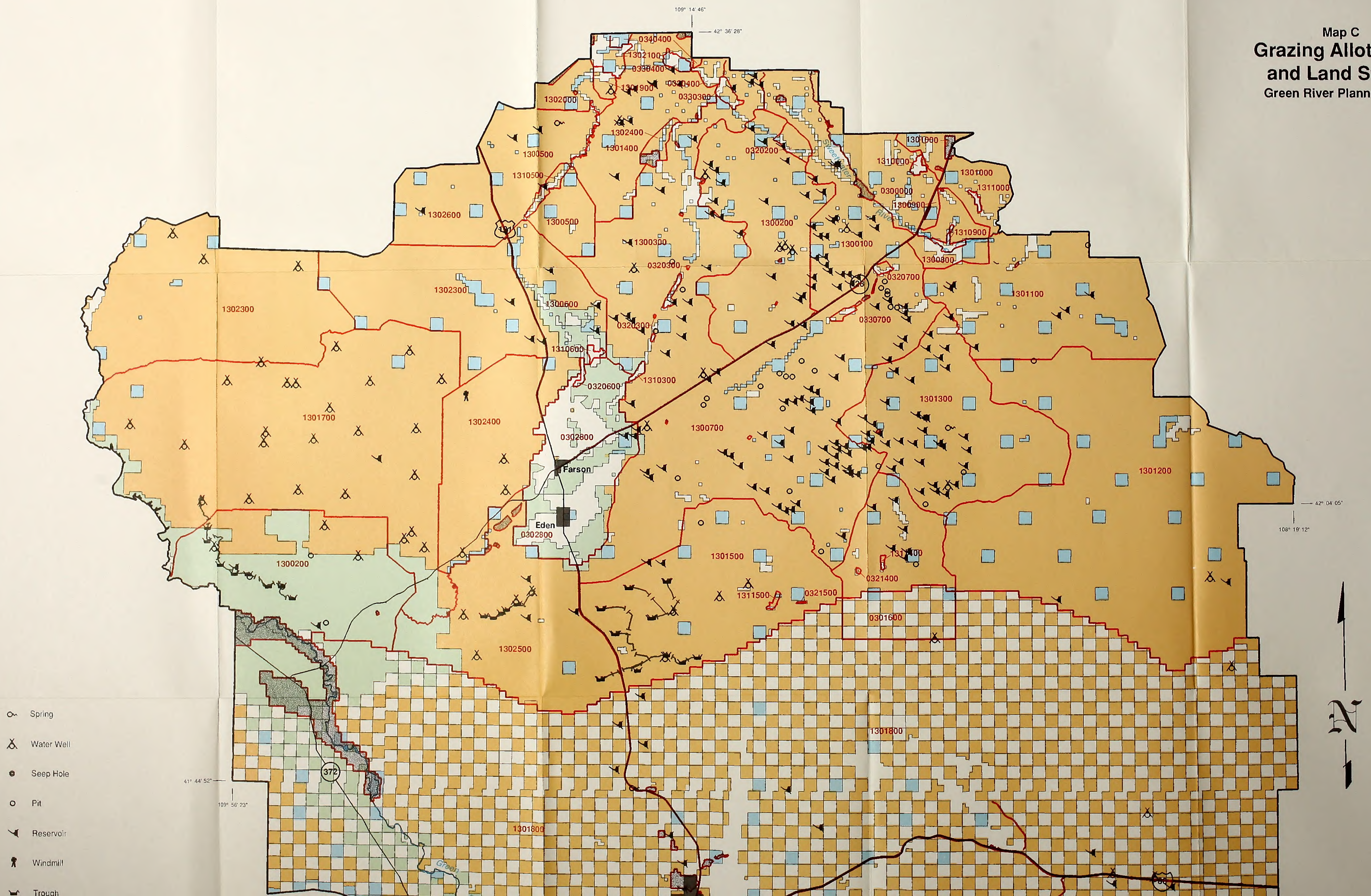
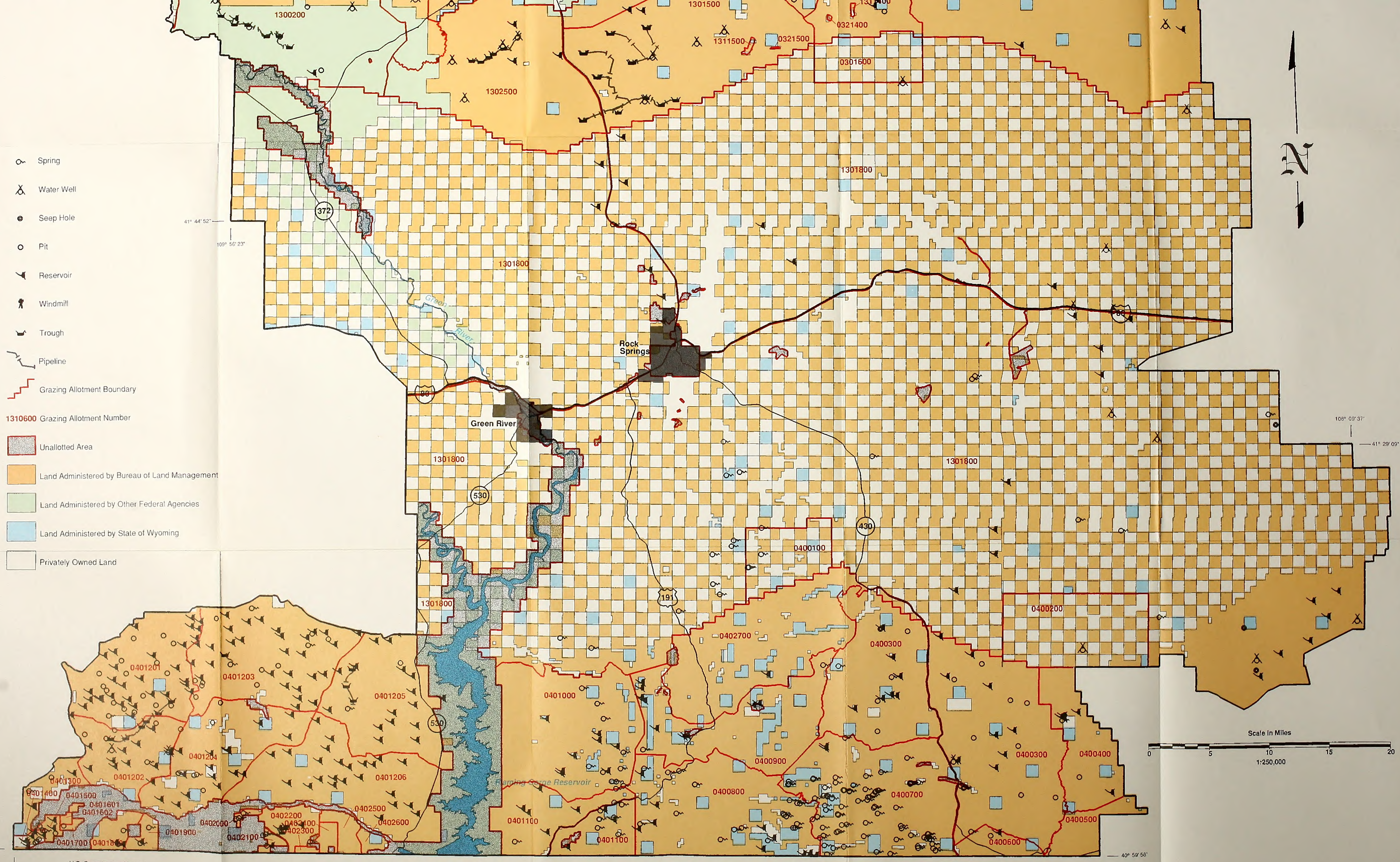
Map C

Grazing Allotments and Land Status

Green River Planning Area





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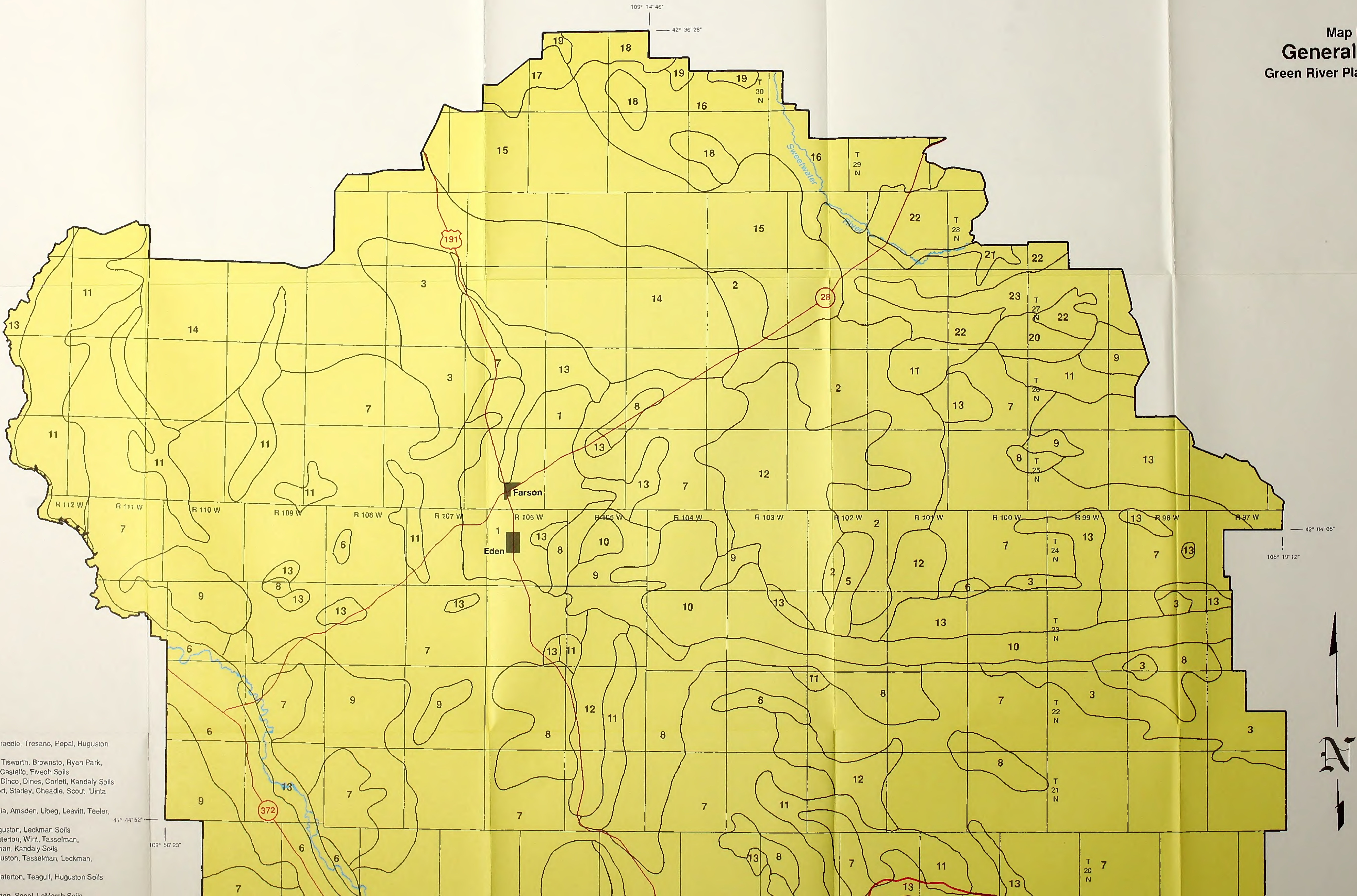
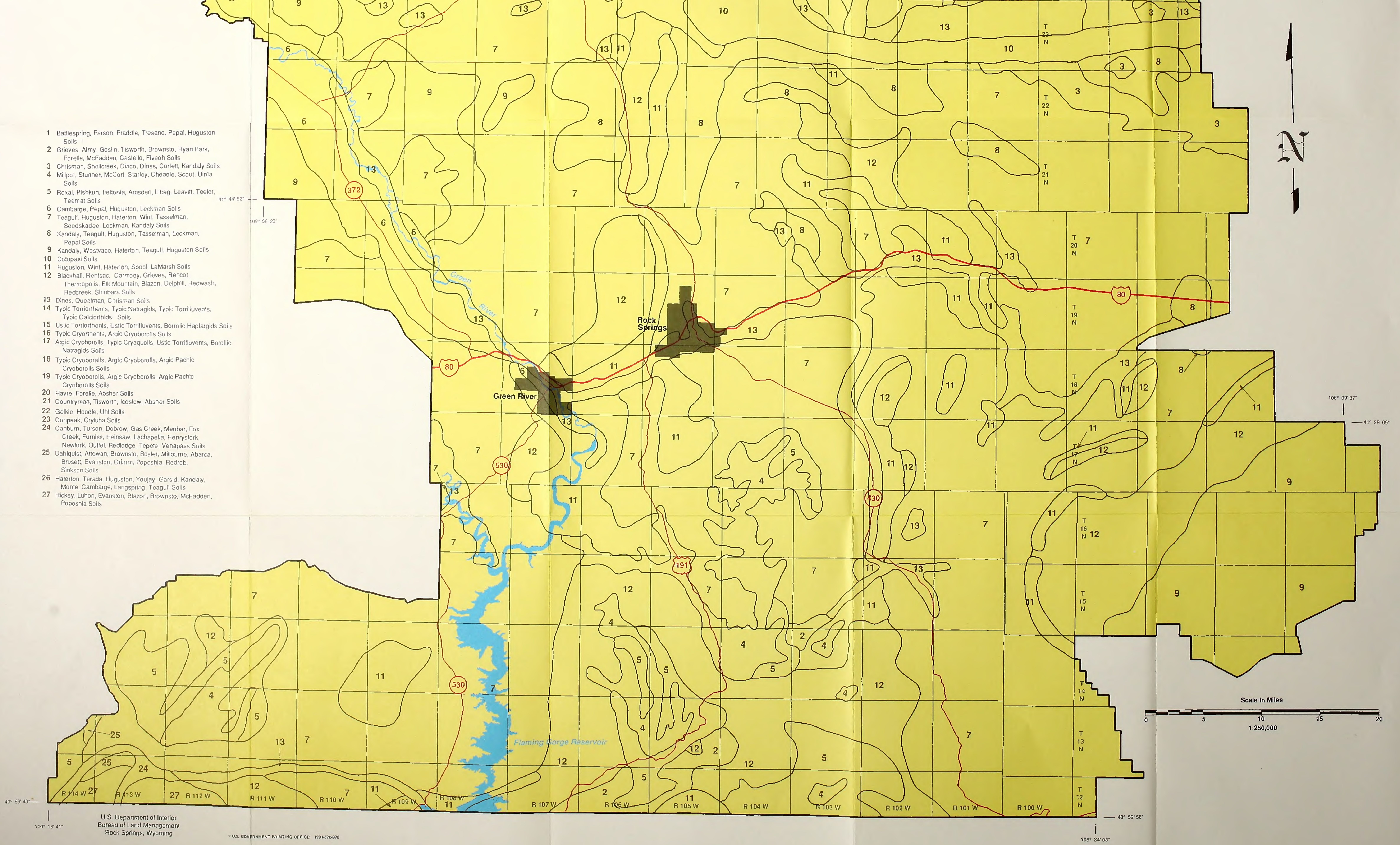
Map D

General Soils

Green River Planning Area



1	Battlespring, Farson, Fraddle, Tresano, Pepal, Huguston Soils
2	Grieves, Almy, Goslin, Tisworth, Brownsto, Ryan Park, Forelle, McFadden, Castello, Fiveoh Soils
3	Chrisman, Shellcreek, Dinco, Dines, Corlett, Kandaly Soils
4	Millpot, Stunner, McCort, Starley, Cheadle, Scout, Uinta Soils
5	Roxal, Pishkun, Feltonia, Amsden, Libeg, Leavitt, Teeler, Teemat Soils
6	Cambarge, Pepal, Huguston, Leckman Soils
7	Teagulf, Huguston, Haterton, Wint, Tasselman, Seedskadee, Leckman, Kandaly Soils
8	Kandaly, Teagulf, Huguston, Tasselman, Leckman, Pepal Soils
9	Kandaly, Westvaco, Haterton, Teagulf, Huguston Soils
10	Cotopaxi Soils
11	Huguston, Wint, Haterton, Spool, LeMarsh Soils



1	Battlespring, Farson, Fraddle, Tresano, Pepal, Huguston Soils
2	Grieves, Almy, Goslin, Tisworth, Brownsto, Ryan Park, Forelle, McFadden, Castello, Fiveoh Soils
3	Chrisman, Shellcreek, Dinco, Dines, Corlett, Kandaly Soils
4	Millpol, Stunner, McCort, Starley, Cheadle, Scout, Uinta Soils
5	Roxal, Pishkun, Feltonia, Amsden, Libeg, Leavitt, Teeler, Teemat Soils
6	Cambarge, Pepal, Huguston, Leckman Soils
7	Teagull, Huguston, Haterton, Wint, Tasselman, Seedskadee, Leckman, Kandaly Soils
8	Kandaly, Teagull, Huguston, Tasselman, Leckman, Pepal Soils
9	Kandaly, Westvaco, Haterton, Teagull, Huguston Soils
10	Cotopaxi Soils
11	Huguston, Wint, Haterton, Spool, LaMarsh Soils
12	Blackhall, Rentsac, Carmody, Grieves, Rencot, Thermopolis, Elk Mountain, Blazon, Delphill, Redwash, Redcreek, Shinbara Soils
13	Dines, Quealman, Chrisman Soils
14	Typic Torriorthents, Typic Natragids, Typic Torrilluvents, Typic Calciorthids Soils
15	Ustic Torriorthents, Ustic Torrilluvents, Borrolic Haplargids Soils
16	Typic Cryorthents, Argic Cryoborolls Soils
17	Argic Cryoborolls, Typic Cryaquolls, Ustic Torrifluvents, Borollic Natragids Soils
18	Typic Cryoboralfs, Argic Cryoborolls, Argic Pachic Cryoborolls Soils
19	Typic Cryoborolls, Argic Cryoborolls, Argic Pachic Cryoborolls Soils
20	Havre, Forelle, Absher Soils
21	Countryman, Tisworth, Iceslew, Absher Soils
22	Gelkie, Hoodle, Uhl Soils
23	Conpeak, Cryluha Soils
24	Canburn, Turson, Dobrow, Gas Creek, Menbar, Fox Creek, Furniss, Heinsaw, Lachapella, Henryslork, Newfork, Outlet, Redlodge, Tepete, Venapass Soils
25	Dahlquist, Attewan, Brownsto, Bosler, Millburne, Abarca, Brusett, Evanston, Grimm, Poposhia, Redrob, Sinkson Soils
26	Haterton, Terada, Huguston, Youjay, Garsid, Kandaly, Monte, Cambarge, Langspring, Teagull Soils
27	Hickey, Luhon, Evanston, Blazon, Brownsto, McFadden, Poposhia Soils

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Rock Springs, Wyoming

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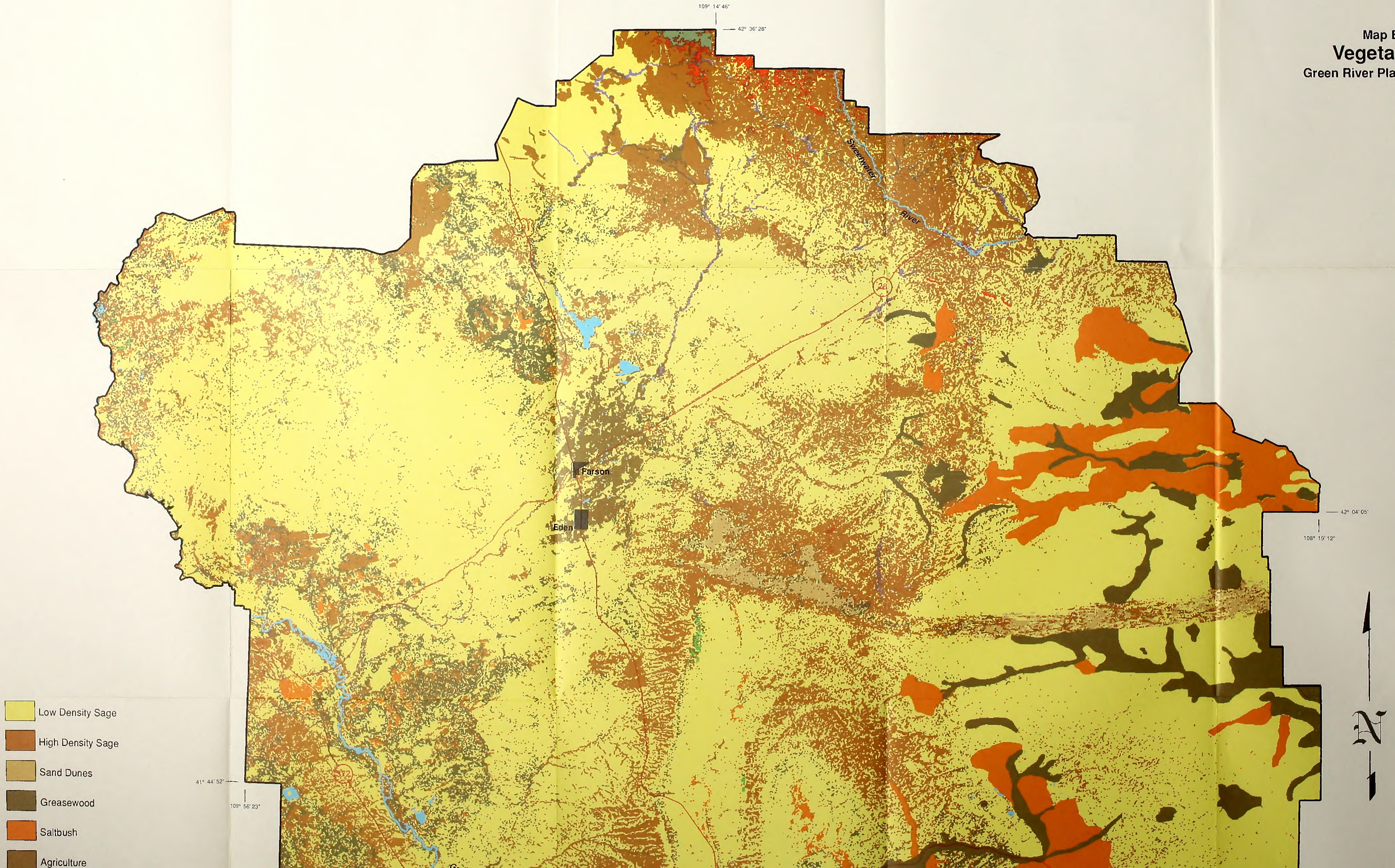
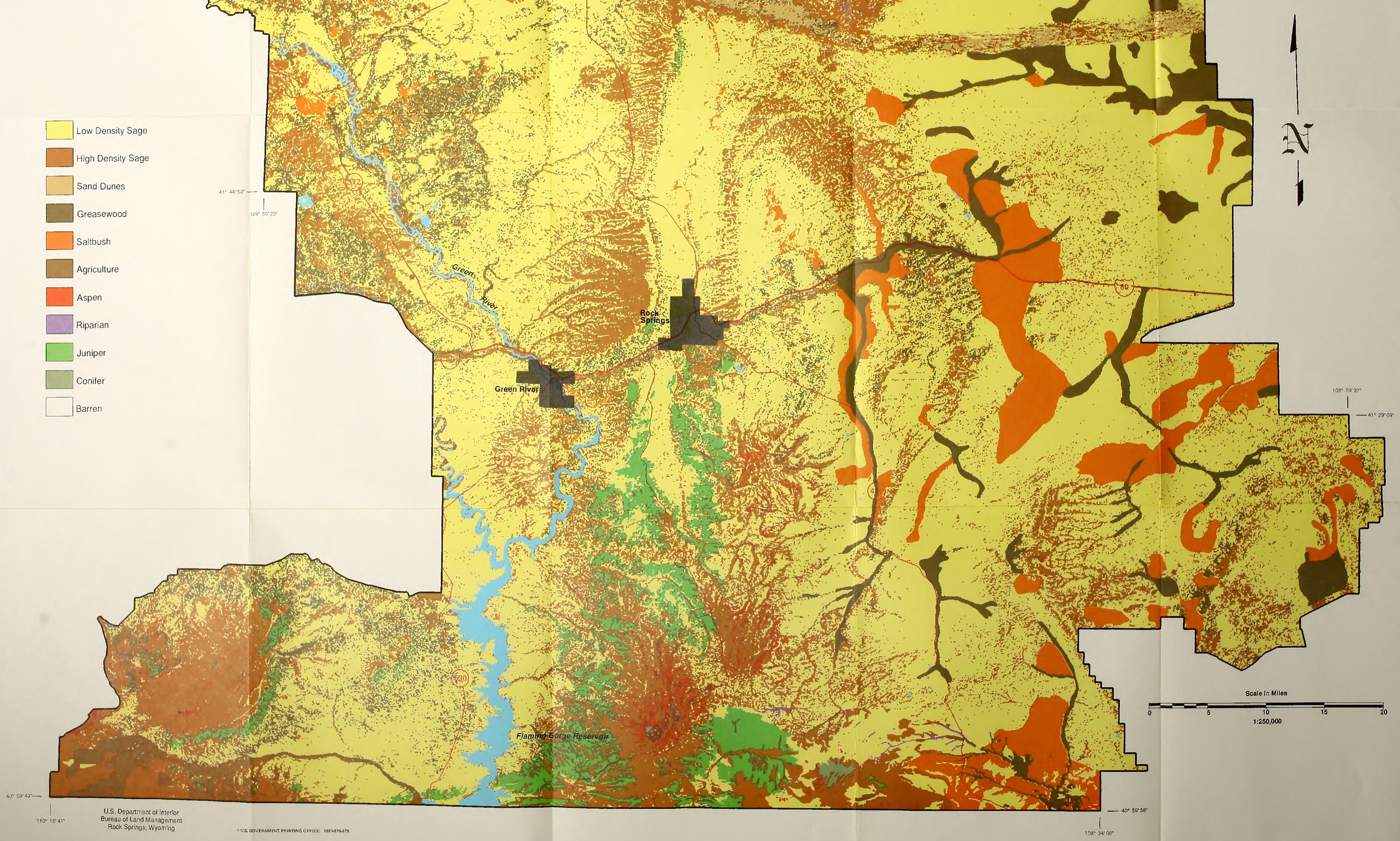
Map E
Vegetation
Green River Planning Area





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